The Town of Deerfield
A Broadband Chapter for Deerfield's Master Plan

Winter in Deerfield, 2011, South Road, Courtesy of SNHPC

Prepared by the Southern New Hampshire Planning Commission for the Town of Deerfield

Funding Provided by the New Hampshire Broadband Mapping and Planning Program

December 2014

Final Draft

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I. Executive Summary

The Town of Deerfield Broadband Chapter for Deerfield's Master Plan was prepared by the Southern New Hampshire Planning Commission (SNHPC) working with Gerry Coogan, Town Planner for the Town of Deerfield. The Planning Board and the newly formed Town of Deerfield Broadband Committee also provided input. Funds were received from the NH Broadband Mapping and Planning Program out of a state grant program of the University of New Hampshire.

Mapping analysis:

- The majority of the town sees average download speeds of greater than or equal to 10 mbps and less than 25 mbps. The northern section, north of Mt. Delight Road, Meeting House Hill and Perry Road is over 1 Gbps because fiber connections available are from 186 Communications, now FirstLight, for commercial institutions.
- Areas of the broadband technology with the fastest reported download speed are the northern part of Deerfield because it is covered by an Optical Carrier/Fiber to the End User, including areas north of Mt. Delight Road, Meeting House Hill Road and Perry Road. There are small pockets of areas using Terrestrial Mobile Wireless including an area to the southwest, south of South Road, an area on the east, east of Tandy Road, and a section south of Parade Road in central Deerfield.
- There is DSL, Cable, Optical Carrier/Fiber on the north side of town and the center of town into the south-eastern section has DSL and Cable. Pockets of DSL are in three locations in the southern part of town and there are pockets of Cable throughout.
- Three major areas within Deerfield have well known dead spots or areas with no/limited broadband service:
    - North-west side of town starting from the Epsom border over to Route 107 along Griffin Road.
    - South-west side of Town alongside the Allenstown border along South Road
    - Along Nottingham Road on the east side and Nottingham border.
- Except for the public safety facility located on Birch Road, which is a reserve station unstaffed most of the year and chose not to have broadband service, none of Deerfield's community anchor institutions are located in identified areas of no or limited service.

Broadband Issues in Deerfield include:

- Broadband capacity in the Deerfield Schools. The Deerfield School District is hoping to increase to 100/100 broadband speed in late 2014 to early 2015 to help solve the issue of sites timing out before they were opened since there was not enough capacity to stream video while doing online work.
- Lack of Broadband cable in the three areas in the town
- Lack of cell phone towers. There are currently no cell towers in Deerfield. In 2013 there was a proposed telecommunications facility (Cell Tower) at 48 South Road which was approved. But Verizon put the approved project on hold due to

changes in technology. Verizon is working to sell the site to another provider or a tower company.

Recommendations include:

- Studying the possibility of developing another section of the Zoning Ordinance on Broadband in addition to Telecommunications
- Making the Broadband Committee a long-term standing committee
- Maintaining a map to monitor coverage of broadband and telecommunications capacity in the town
- Expanding the access of broadband service in the limited coverage areas.

II. **Introduction**

The State of New Hampshire is currently working on the New Hampshire Broadband Mapping and Planning Program (NHBMPP), a coordinated, multi-agency initiative funded by the American Recovery and Reinvestment Act through the National Telecommunications and Information Administration (NTIA). It is part of a national effort to expand high-speed internet access and adoption through improved data collection and broadband planning. The University of New Hampshire's GRANIT program was granted $1.7 million to manage the program which will inventory and map current and planned broadband coverage available to the state's businesses, educators, and citizens. The project is comprised of two components: a five-year broadband availability inventory and mapping effort, and a four-year planning initiative.

The inventory used service-area landline and wireless data collected from the 60-plus public and commercial entities that currently provide broadband services in the state.[1] This data shows service availability, type, and technology and will help to identify areas of the state that are unserved or underserved by the current broadband infrastructure. Concurrently rural addresses are being collected through the program to develop a database containing a mapped point feature and associated street addresses for every residential address in the rural Census blocks in the State of New Hampshire. Rural Census blocks are defined as having an area of at least two square miles. 2010 U.S. Census figures for the entire state of New Hampshire identify a total of 39,991 households within those rural blocks. Lastly, data is also being collected on broadband availability at individual community anchor institutions such as schools, libraries, medical/healthcare locations, public safety offices, and state, county, and municipal buildings.

The planning component of the NHBMPP will incorporate the information collected and the momentum generated by the mapping activities into regional broadband plans throughout New Hampshire. The development of these regional plans will be coordinated by the state's nine regional planning commissions. The plans will involve establishing regional broadband stakeholder groups to identify barriers to broadband deployment, promote collaboration with service providers, and facilitate information sharing regarding the use of and demand for broadband services. Additional support for the program will be provided by a variety of state agencies, including the Division of Economic Development, the Office of Energy and Planning, and the Public Utilities Commission.[2] To learn more about this program see: http://www.iwantbroadbandnh.org/.

The Southern New Hampshire Planning Commission (SNHPC) received funding from the NH Broadband Mapping and Planning Program (NHBMPP) to create maps and write a Broadband Plan for the Town of Deerfield. The NHBMPP is managed by the

[1] For a full list refer to: New Hampshire Broadband Mapping and Planning Program, http://iwantbroadbandnh.com/where-is-broadband. February, 2012.
[2] NH Business Resource Center, http://blog.nheconomy.com/?tag=new-hampshire-broadband-mapping-program

University of New Hampshire GRANIT System and is funded by the American Recovery and Reinvestment Act through the National Telecommunications and Information Administration (NTIA). The NHBMPP was created to study broadband availability in the state of New Hampshire and create an inventory and map it. It also provides technical assistance activities. The website says its goals are to understand where broadband is currently available, how it can be more widely available in the future, and how to encourage increased levels of broadband adoption and usage. The program realizes that broadband infrastructure can support economic development, energy efficiency, and advances in healthcare and improved educational opportunities.

Other programs include Network NH Now (NNHN), a sister program of the NHBMPP designed to provide broadband connectivity that is symmetrical and capable of delivering current and next generation services that are comparable to the rest of the country. The end result will enable many social service, non-profit and commercial organizations to receive reliable service without having to pay for expensive copper-based connections. This will assist New Hampshire's competitiveness to attract potential businesses and investment. To learn more about this program see: http://www.networknhnow.org/.

NH FastRoads intends to build an open access middle mile and last mile network that aggregates demand for an entire region in New Hampshire, including community anchor institutions, large and small businesses, government offices and agencies, and residents. The routes built provide middle mile and last mile projects that will offer fiber connections to businesses and residents in the project area, where many residents are still limited to dial up Internet access. To learn more about this program see: http://www.newhampshirefastroads.net/.

During the month of December 2014, SNHPC went before the Deerfield Planning Board twice to present the plan and receive input. In December 2014 the Town of Deerfield Broadband Stakeholder Group (BSG) was formed and had its first meeting.

During the first meeting the following topics were discussed:

- Is there a need for more cell towers?
- Is there adequate wireless communication and Wifi for town and public buildings?
- What streets, subdivisions, neighborhoods are currently underserved?
- What are the elements of the town's recent cable franchise agreement?
- What is the assessment of town's telecommunications regulations with respect to state statutes?

The answers to these questions in addition to the latest speed information provided by maps and what service providers exist in town will be discussed in the course of this plan. The three goals of this chapter are to: (1) provide a brief overview of broadband technology, identifying strengths and weaknesses that exist in the Town of Deerfield's broadband coverage; (2) identify barriers to access for coverage expansion; and (3) make recommendations for what improvements can be made in Deerfield to increase high speed broadband access throughout the community.

III. Introduction to Broadband

Reliable high speed broadband access is an increasingly important asset for communities. The benefits of having reliable and high speed broadband internet services is critical for rural economic development, small business growth, emergency services, and can result in increased property values and improved quality of life. The proliferation and expansion of broadband access today is often paralleled with the great public infrastructure projects of the Twentieth Century – namely the expansion of the electricity network and the creation of the interstate highway system. Like those two monumental public works projects, high speed broadband access creates economic development opportunities, increases the potential of business and industry, provides greater educational opportunities to both adults and children, improves the ability and efficiency of emergency responders and government officials to effectively do their jobs and improve the lives of all citizens.

However, high speed broadband access is often hindered by factors such as low population densities, and geographical barriers such as topography and infrastructure costs. It does not make economical sense for internet service providers to extend the necessary "last mile" broadband infrastructure to homes and businesses in remote locations. As a result, rural residents and businesses must deal with spotty or non-existent broadband coverage. Approximately 19 million Americans— six percent of the population— still lack access to fixed broadband service at threshold speeds. In rural areas, nearly one-fourth of the population — 14.5 million people — lack access to this service. In tribal areas, nearly one-third of the population lacks access. Even in areas where broadband is available, approximately 100 million Americans still do not subscribe. Because millions still lack access to or have not adopted broadband, the Eighth Broadband Progress Report by the Federal Communications Commission concludes broadband is not yet being deployed in a reasonable and timely fashion.[3] The report concludes that until the Commission's Connect America reforms are fully implemented, these gaps are unlikely to close.

The National Broadband Map was created by the National Telecommunications and Information Administration, the Federal Communications Commission (FCC) and all states of the United Stations. It is an online tool that provides semi-annual information on the availability, technology, speed, and location of broadband Internet access at the census block level. Rockingham County has a total population of 295,074 with a total population without access at 15,944. With a population density (population per square mile) at 425 and a per capita income of $35,889, the percentage of housing units in County with access to broadband by technology with fiber at 0 percent and cable at 78 percent (National Broadband Map Data, Eighth Broadband Progress Report, Federal Communications Commission, June 2011).

The University of New Hampshire Survey Center conducted a telephone survey in 2013 which revealed that 93 percent of the Manchester region had access to internet at home.

[3] "Eighth Broadband Progress Report, Federal Communications Commission, August 2012.

Statewide, it was found that those who are age 70 or older, those unemployed and looking for work, those with a high school education or less, and households earning less than $20,000 are less likely to have internet access at home. The results of this survey are in Appendix B.

A. Federal Telecommunications Act of 1996

The Federal Telecommunications Act of 1996, enacted by the Federal Communications Commission (FCC) is the comprehensive federal law that governs the telecommunications industry to this day. Section 704 of the Act specifically outlines the land use and zoning roles local governments can play regarding telecommunications and wireless infrastructure. It grants local governments zoning authority for the most part, stating "Nothing in this Act shall limit or affect the authority of a State or local government or instrumentality thereof over decisions regarding the placement, construction, and modification of personal wireless service facilities." There are several exceptions and/or limitations to this statement outlined in the Section 704, which include:

- Land use development standards may not unreasonably discriminate among wireless service providers and may not prohibit the deployment of personal wireless services.

- Local governments must act upon applications for new wireless infrastructure within a reasonable period of time after the request is filed according to the nature and scope of the request.

- Land use policies may be adopted to promote the location of telecommunications facilities in certain designated areas. The Act also encourages the use of third party professional review of site applications.

- Local governments cannot deny an application for a new wireless facility or the expansion of an existing facility on the basis of the environmental effects of radio frequency emissions, provided such facilities comply with the FCC's emissions regulations.

Section 704 also states:

> "Any person adversely affected by any final action or failure to act by a State or local government or any instrumentality thereof that is inconsistent with this subparagraph may, within 30 days after such action or failure to act, commence an action in any court of competent jurisdiction."

Additionally, Section 707 of the Act requires states to keep up to date with the latest advanced technology available and to help foster its expansion. This applies especially to broadband service, which was not widely available in 1996 when the Act was initially released. The Section states:

> "The Commission and each State commission with regulatory jurisdiction over telecommunications services shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) by utilizing, in a manner consistent with the public interest, convenience, and necessity, price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment.[4]"

B. Broadband Technology

The term broadband denotes "a type of high-speed data transmission in which the bandwidth is shared by more than one simultaneous signal."[5] This technology is in comparison to the old "narrowband" technology which used telephone lines for a dial-up connection of about 56 kbps. Today's broadband is hundreds of times faster than narrowband and measured in megabits per second rather than kilobytes per second. As of 2011, the National Telecommunications and Information Administration (NTIA) has set the minimum speed for service to be considered true broadband at download speeds of 768 kbps and upload speeds of 200 kbps.

Broadband is delivered to residential and business through either telephone or cable lines. A Digital Subscriber Line (DSL) transmits high capacity digital signals over telephone lines at high frequency bands while cable-based broadband utilizes higher capacity television lines to deliver internet service. Both DSL and cable internet services provide a broader, higher capacity spectrum of service than traditional dial-up.

Commercial users and large institutions often choose higher capacity T-1 copper wire and fiber optic lines. T-1 provides the customer with a dedicated line to the internet that bypasses the local Internet Service Provider's (ISP) network. Fiber optic lines deliver information using pulses of light through optical fiber and are able to deliver higher bandwidths of information over longer distances than DSL or cable. While T-1 and fiber optic technologies offer high speeds and capacities, both are considerably more expensive to operate than DSL or cable and are typically unavailable in more remote locations.

These access problems lie in what is typically referred to as the middle and last mile segments of local infrastructure. Information is transmitted over the internet to the end user in three general steps – from the internet backbone to middle mile infrastructure and finally to last mile infrastructure. The internet backbone refers to the main trunk "super highway" connections of the Internet, which is made up of a large collection of interconnected commercial, government, academic and other high-capacity data routes

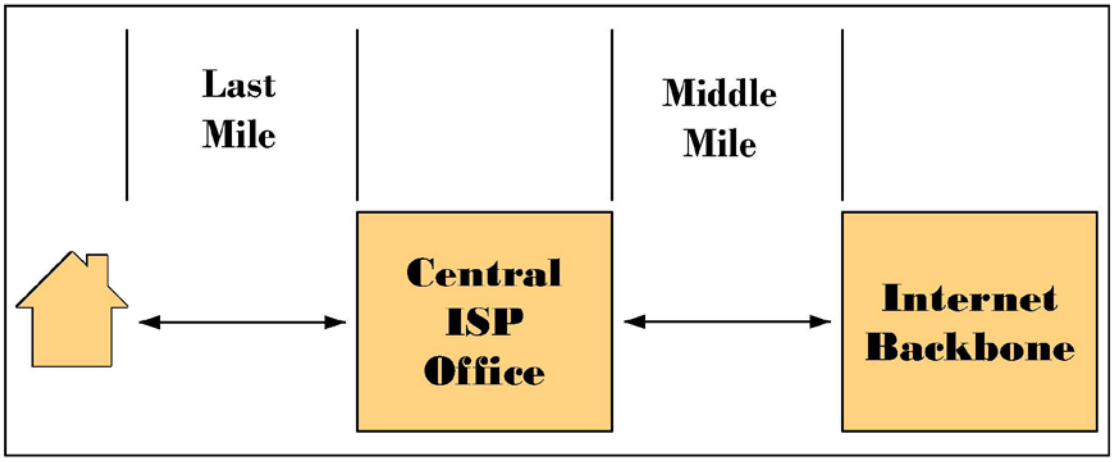
[4] All the information contained in this section is provided from the Federal Communications Commission's 1996Telecommunications Act, http://www.fcc.gov/Reports/tcom1996.pdf

[5] New Hampshire Broadband Mapping and Planning Program, http://iwantbroadbandnh.com/where-is-broadband. February, 2012.

and routing devices that carry data across the US and the rest of the world.[6] The middle mile portion of the broadband network essentially connects the main trunk lines to the local ISP's central exchange location, also referred to as a telecom hotel. From there, the ISP uses the last mile (sometimes referred to as the first mile) to deliver broadband over cable or telephone lines to its final destination at the subscriber's home or business. The term "last (or first) 100 feet" is used occasionally to describe a fourth and final link in the process – the connection from the utility pole into the subscriber's home or business (See figure 1).

More remote communities oftentimes lack middle mile infrastructure, meaning that broadband lines are not present in the town and access is not available anywhere. It is also common that many communities have middle mile infrastructure, but large segments are not serviced by last mile. In many places it may not make financial sense for service providers to extend broadband lines to individual homes in moderately to sparsely populated areas, resulting in large areas with no wired service. These two problems are common in many rural New Hampshire communities and must be addressed.

Figure 1:
Diagram of Broadband Infrastructure



Source: SNHPC 2012

To put it simply, broadband is a relative term and while the federal definition used is 1.024 Mbps download, 758 Kbps (or 0.78 Mbps) upload, which is slow by many broadband standards and too slow for dependable streaming of high-quality video. Informal or industry definitions start at three times as fast, or 3 Mbps download, and some begin at 10 times as fast. Fiber-to-the-home service, generally the fastest broadband available to residences, can approach 100 times the federal definition. Options include DSL, or broadband over copper phone lines, satellite Internet service,, cable television companies, and high-speed modems. Fixed wireless service, which is Internet signals from towers similar to way it comes from cell phones, is becoming

[6] North Florida Broadband Authority, http://nfba-fl.org/MiddleMile.asp

serious alternative in rural, hilly areas where it is too expensive to run cable to widely scattered homes or businesses. There is also 3G or 4G high-speed data from cell phone companies such as Verizon Wireless, AT&T and Sprint.

More Broadband definitions can be found in Appendix C.

IV. Current Broadband Status in Deerfield

A. Metrocast Franchise Agreement

As of December 2014, there is a Franchise Agreement between the Town of Deerfield and Metrocast Cablevision of New Hampshire, LLC which is located in Belmont, NH. Metrocast filed a request of a renewable of its 2000 Franchise by letter dated December 23, 2010 and it was approved in 2013. Metrocast has upgraded its hybrid fiber optic and coaxial cable network to 860 MHz through which a variety of video and communications services are being provided to the Town's residents and businesses. The term of the Franchise is for a period of ten years terminating on December 31, 2023. The Franchisee pays the Town a Franchise Fee of 3 percent of its Gross Revenues and payment is due each April 1. The Franchising Authority has the option, to be exercised by vote of the Board of Selectmen, to increase the Franchise Fee annually, up to a total of five percent of the company's Gross Revenues in increments of one percent annually. Changes to the Franchise Fee shall be implemented no later than 90 days after written notice from the Board of Selectmen, who also have the option to eliminate the Franchise Free or decrease it.

Article 3 in the Franchise Agreement discusses the service area and line extensions. Whenever Metrocast receives one or more requests for Cable Service from at least five subscribers located within one-half mile of its Cable System, it shall extend it at no cost providing that it is technically and financially feasible and each subscriber agrees to pay in advance for one year of Basic Service at the rate in effect at the time. Whenever Metrocast receives one or more requests for Cable Service that does not meet the density of five subscribers per one-half mile the cable service may be made available provided the total cost for line extensions are paid by the suscribers. In addition, Metrocast can extend Cable Service to any area upon written request of the Franchise Authority and if the Franchise Authority agrees to pay for it. Metrocast needs to construct line extensions no later than 90 days after agreement. Section 3.3 discusses the residential system and states that Metrocast will maintain a two way capable, Residential System utilizing Addressable Technology with cable and electronics transmitting a bandwidth of at least 860 MHz.

Future Technology is discussed in Section 3.4 of the Metrocast Franchise Agreement and after three years of the Agreement, if requested in writing by the Franchise Authority, Metrocast shall review changes in relevant cable television technology that might benefit Town Subscribers. It should provide Cable Services equal to those services available to

at least 50 percent of all subscribers in the following municipalities: Rochester, NH; Meredith, NH; Belmont, NH; Laconia, NH and Sanford, ME.

In regard to Access Channels, Section 3.7 states that Metrocast needs to provide up to three local Access Channels for broadcasting over the Cable System by the Town, one for government programming, one for educational programming and one for public access programming. Effective January 1, 2014, Access Channels are governmental programming on Channel 26, public access programming on Channel 25 and educational programming on Channel 24. Section 3.8 notes that the Cable System also needs to incorporate an audio override capability for use in the event of an emergency consistent with FCC and State regulations. Metrocast provides basic service to all municipal and school buildings within 200 feet of Feeder Cable and donate coaxial cable for each classroom of the public schools in Town.

The town should have a complete set of strand maps of the service area that shows Metrocast's cable and equipment in those areas where facilities exist and location of all streets. Access origination points are at the Deerfield Community School (66 North Road) and the Geo B. White Building-Town Offices (8 Raymond Road). The Cable Service Drop Points are at the following locations: Town Hall (10 Church Street), Patrick James Library (4 Church Street), Deerfield Community School (66 North Road) Geo B. White Building-Town offices (8 Raymond Road), Central Fire Department (6 Church Street), Highway Department (8 Church Street), Police Department (8 Raymond Road) and Birch Road Fire Department (33 Birch Road).

B. Telecommunications

In regard to telecommunications via cell phone towers, in 2013 there was a proposal to the Deerfield Planning Department for a proposed telecommunications facility (Cell Tower) at 48 South Road. Propagation analysis was performed for the proposed Verizon Wireless location at this location. Three heights were analyzed: 150 feet, 125 feet and 100 feet. Maps were provided in the IDK Communications report that depict the results with the coverage in green and blue. The green represents in-building coverage while the blue is the additional in-vehicle coverage. Areas with less than reliable coverage are shown in white. For the proposed location at a height of 150 feet the site will provide coverage to the southern part of the Town in the areas of South Road and Route 43. The coverage analysis for 125 feet showed a reduction of coverage mainly on the outskirts of the target area and within vehicle coverage. The majority of coverage for South Road and Route 32 is not greatly impacted with this reduction in antenna height. Finally, IDK ran an analysis at a height of 100 feet which shows that additional coverage is lost along South Road both east and west of the site as well as the interconnecting roads. It also limits the amount of co-location possible o this structure. Once antennas start to get below 90 feet the surrounding terrain will begin to pose a greater impact to propagation and may not be suitable for another wireless carrier (IPG, 2014). At present, Verizon put the approved project on hold due to changes in technology. Verizon is working to "shop" the approval to another provider or a tower company.

The Town of Deerfield has a section on telecommunications facilities in its Zoning Ordinance, Section 329 Wireless Telecommunication Facilities Ordinance which was adopted March 14, 2006. The regulations were enacted to establish general guidelines for the siting of towers and antennas and to enhance and fulfill the goals of providing for reasonable opportunity for siting of telecommunication facilities.

In regard to Cellular Towers in the Town of Deerfield, there is only one on the northern border shared with the Town of Northwood.

C. Coverage areas

Identified in the list below are the broadband providers that submitted data to the NHBMPP in the fall of 2011 indicating they offer broadband services via the technologies discussed in the previous section. These providers were asked to identify those technologies and services currently available within the Town of Deerfield and may offer additional broadband technologies in other areas of the state.

- AT&T Mobility, LLC
- FairPoint Communications, Inc.
- G4 Communications
- MetroCast (currently the town's primary cable provider)
- Sprint
- T-Mobile
- Verizon Wireless
- 186 Communications
- Comcast
- U.S. Cellular

Service areas within the Town of Deerfield have been identified through the NHBMPP and can be found on the following maps. If there is one unit served than the entire census block is denoted. The maps are shown in the following pages and are based on broadband access information submitted to NHBMPP as of September 30, 2014. The shaded areas indicate the technology delivering the maximum download speed among all available technologies within that area. Additional technologies may deliver broadband to that area at slower speeds. Only those internet service providers that offer residential service or do not differentiate between business and residential service are being shown. Service providers submitted data in a range of geographies, including addresses, road segments, and census blocks. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block. Satellite providers HughesNet, Skycasters, Star Band Communications and ViaSat fka WildBlue were excluded from the speed analysis. Broadband was defined as access that is at least 768 kbps downstream and 200 kbps upstream.

Map 1 shows **Maximum Advertised Download Speed** and displays the range of download speeds reported by the broadband service providers within Deerfield. Currently as reported, Deerfield, as like many rural communities reside in the lower speed capabilities. In this case the majority of the Town sees average download speeds of greater than or equal to 10 mbps and less than 25 mbps. While even more sprawling areas find uniformly lower download speed capabilities ranging from three to 10 mbps. The northern section, north of Mt. Delight Road, Meeting House Hill and Perry Road is over 1 Gbps. The fiber connections available are from 186 Communications, now FirstLight, are for commercial institutions.

This map is based upon the broadband information submitted by the service providers to the NHBMPP as of September 30, 2014. For mapping purposes, this data was aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block. Further data collection is needed to refine the service area to a smaller scale.

Map 2 shows **Broadband Availability** and displays the broadband technology with the fastest reported download speed within Deerfield. The northern part of Deerfield is covered by an Optical Carrier/Fiber to the End User, including areas north of Mt. Delight Road, Meeting House Hill Road and Perry Road. There are small pockets of areas using Terrestrial Mobile Wireless including an area to the south-west, south of South Road, an area on the east, east of Tandy Road, and a section south of Parade Road in central Deerfield. The rest of the town has Cable service.

Similar to Map 1, the majority of Deerfield is covered by cable or DSL technologies. However those areas not along the main corridors of Deerfield and in more sprawling locations have access to technologies with reduced download speeds. In those areas with reduced speeds the greatest technologies reported were that of terrestrial mobile wireless. Wireless broadband uses a radio link between the user's location and the service provider's facility. Wireless technologies are beneficial in providing broadband service in these sparsely populated areas where typical DSL, cable modem, or fiber broadband service would be too costly to provide. This is a prime example of a location that could benefit from "last-mile" wire line broadband connections.

The map is based upon the broadband information submitted by the service providers to the NHBMPP as of September 30, 2014. For mapping purposes, this data was aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block. Further data collection is needed to refine the service area to a smaller scale.

Map 3 shows **Service by Technology Type** which gives a more detailed portrayal of the technologies that are included in each census block. In the northern section of town you have DSL, Cable, Optical Carrier/Fiber to the End. The central part down into the south-

eastern section has DSL, Cable. Pockets of DSL are in three locations in the southern part of town and there are pockets of Cable throughout.

Along the main corridors you find advanced technologies that will produce adequate download speeds for residential and small business use but as found on Map 1 actually speeds vary and are in need of upgrade for future development. However in the sparse areas where costly infrastructure is needed, you find either terrestrial fixed or mobile wireless or no service all together. This is regarded as “last mile” wire line connection.

The map is based upon the broadband information submitted by the service providers to the NHBMPP as of September 30, 2014. For mapping purposes, this data was aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block. Further data collection is needed to refine the service area to a smaller scale.

Map 4 shows **Town Identified Areas with No or Limited Broadband Service** and identifies three major areas within Deerfield that have well known dead spots or areas with no/limited broadband service. This map was defined through a collaborative effort between the Deerfield Planning Department and the Town Fire Department during the fall of 2010. While neither the SNHPC nor the Town of Deerfield guarantees the accuracy of the data included on this map, the areas identified as no service areas are approximate locations and are based, to the extent possible, on the best available local information at the time of discussion. Additional research is likely needed to more accurately identify areas with no/limited wireless service.

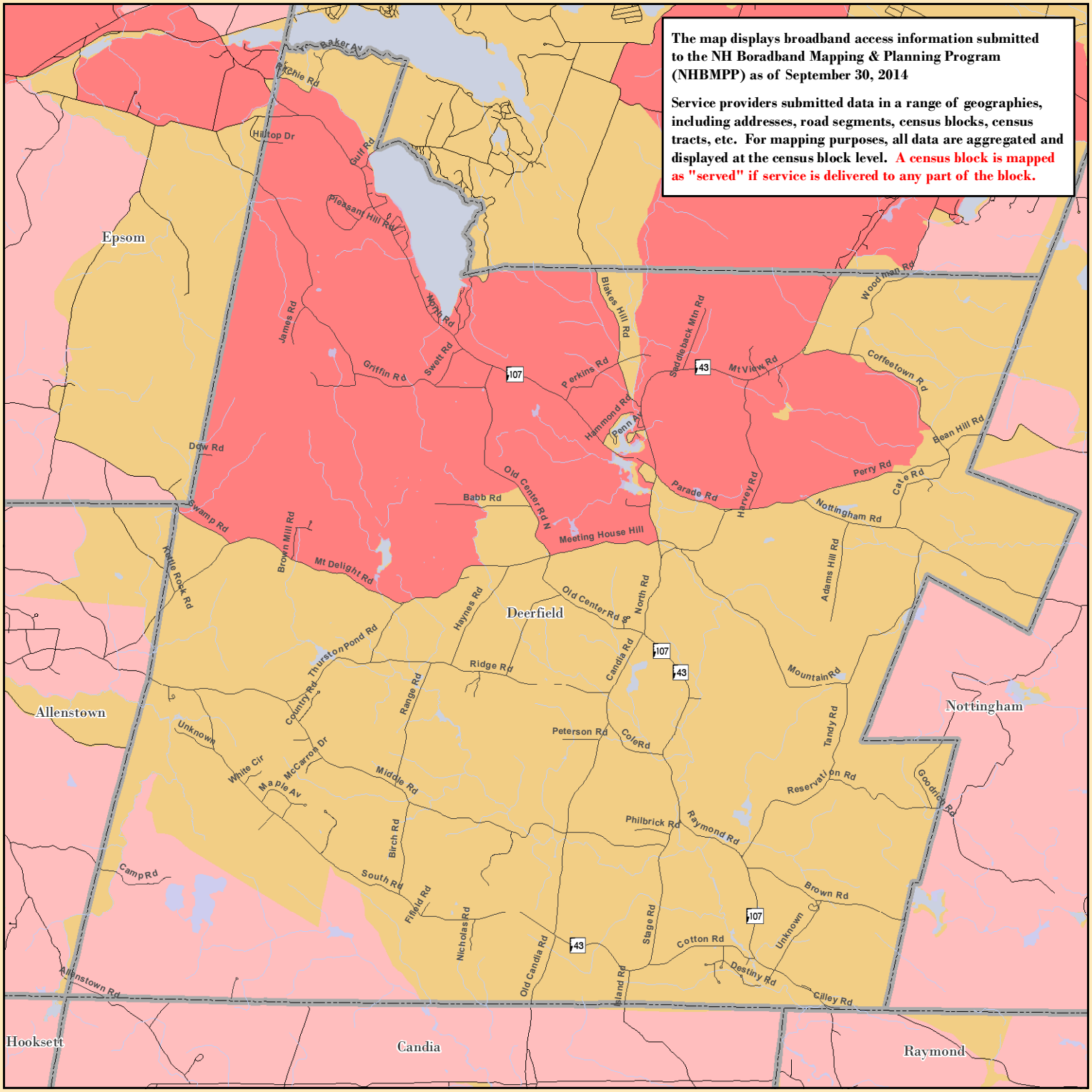
Areas of limited Broadband Service identified include a pocket in the north-west side of town starting from the Epsom border over to Route 107 along Griffin Road; a section in the south-west side of Town alongside the Allenstown border along South Road; and a tiny pocket along Nottingham Road on the east side and Nottingham border

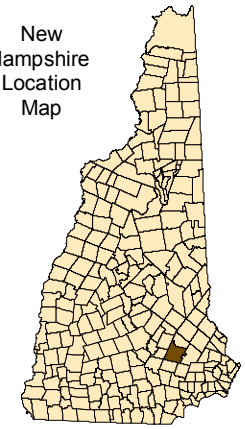
Map 5 shows **Community Anchor Institutions** which indicates the access of broadband technologies to community anchor institutions within town boundaries. This includes K-12 schools, medical facilities, government offices, public safety locations, universities and colleges, and libraries. Areas showing no service may not have access to service, may choose not to have service, or may not have participated in the survey conducted by the NHBMPP.

Except for the public safety facility located on Birch Road, which is a reserve station that is left unstaffed most of the year and chose not to have broadband service, none of Deerfield’s community anchor institutions are located in identified areas of no or limited service as shown on Map 5. Deerfield community anchors mostly exist along main corridors were adequate download speeds are available. Future consideration of new community anchors should refer to Maps 1-5 to evaluate best location for adequate broadband capabilities.

Community Anchor Institutions Identified:

Community Anchor Institutions	Address	Category
RSEC (Regional Services and Education Center) - Longview	55 Reservation Rd, Deerfield, NH 03037	School - K Through 12
Deerfield Community School	66 North Rd, Deerfield, NH 03037	School - K Through 12
Philbrick-James Library	4 Church St, Deerfield, NH 03037	Library
Deerfield Community School Library	66 North Rd, Deerfield, NH 03037	Library
Heavens Caring, LLC	55 Raymong Rd, Deerfield, NH 03037	Medical
Inn at Deerfield, Inc (The)	34 Ridge Rd, Deerfield, NH 03037	Medical
Deerfield - Fire Department	6 Church St, Deerfield, NH 03037	Public Saftey
Deerfield - Highway Department Garage	10 Church St, Deerfield, NH 03037	Public Saftey
Deerfield - Town Hall (shelter)	6 Church St, Deerfield, NH 03037	Public Saftey
Deerfield - Fire Substation	33 Birch Rd, Deerfield, NH 03037	Public Saftey
Deerfield - Police Station	8 Raymond Rd, Deerfield, NH 03037	Public Saftey
Deerfield - Transfer Station	51 Brown Rd, Deerfield, NH 03037	Communtiy Support
Deerfield - Town Offices	8 Raymond Rd, Deerfield, NH 03037	Communtiy Support
Deerfield Fairgrounds Firehouse	34 Stage Rd, Deerfield, NH 03037	Communtiy Support
Deerfield Fairgrounds Fine Arts and Craft Building (back-up Shelter)	34 Stage Rd, Deerfield, NH 03037	Communtiy Support
Deerfield Fairgrounds Administration Building (back-up Emergency)	34 Stage Rd, Deerfield, NH 03037	Communtiy Support





Map # 1 A

Commercial & Residential
Maximum Advertised Download Speed
Town of Deerfield, NH

Maximum Advertised Downstream Speed

- >= 10 Mbps and < 25 Mbps
- >= 100 Mbps and < 1 Gbps
- >= 1 Gbps (May only be available to Commercial Customers)

0 0.475 0.95 1.9 2.85 3.8 Miles

Data Source:
GRANIT digital Data (1:24.000)
Southern NH Planning Commission
NH Department of Transportation
US Census Bureau

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The individual municipalities represented on this map and the SNHPC make no representations or guaranties to the accuracy of the features and designations of this map.

Map Produced by: GIS Service SNHPC 2014.
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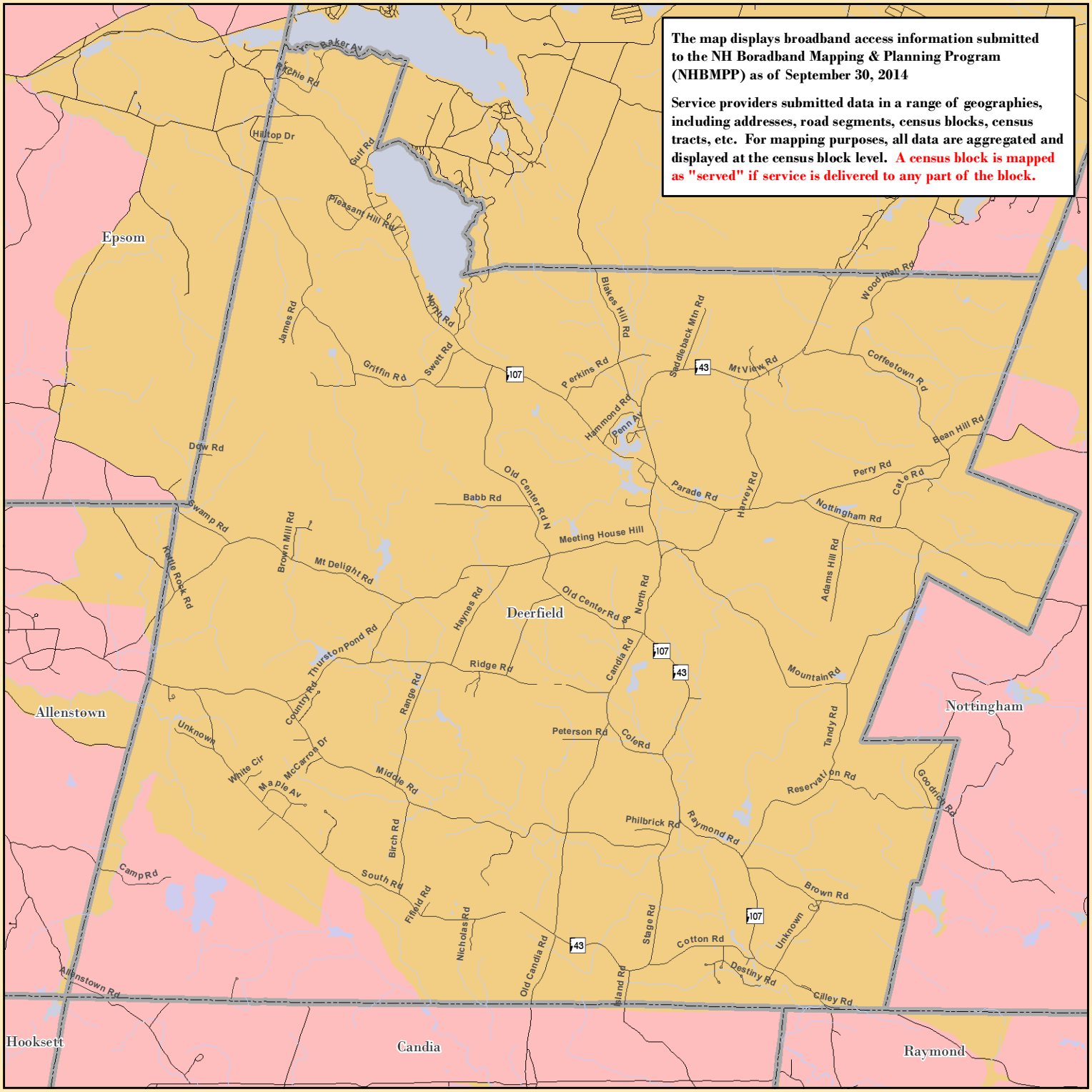
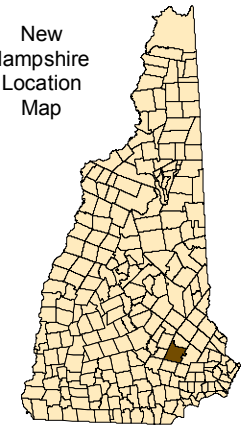
This map is for planning purposes only. It is not to be used for legal boundary determinations or for regulatory purposes.

broadband MAPPING & PLANNING PROGRAM

SNHPC





Map # 1 B

Residential
Maximum Advertised Download Speed
Town of Deerfield, NH

Maximum Advertised Downstream Speed

- >= 10 Mbps and < 25 Mbps
- >= 100 Mbps and < 1 Gbps

0 0.475 0.95 1.9 2.85 3.8 Miles

Data Source:
GRANIT digital Data (1:24.000)
Southern NH Planning Commission
NH Department of Transportation
US Census Bureau

N

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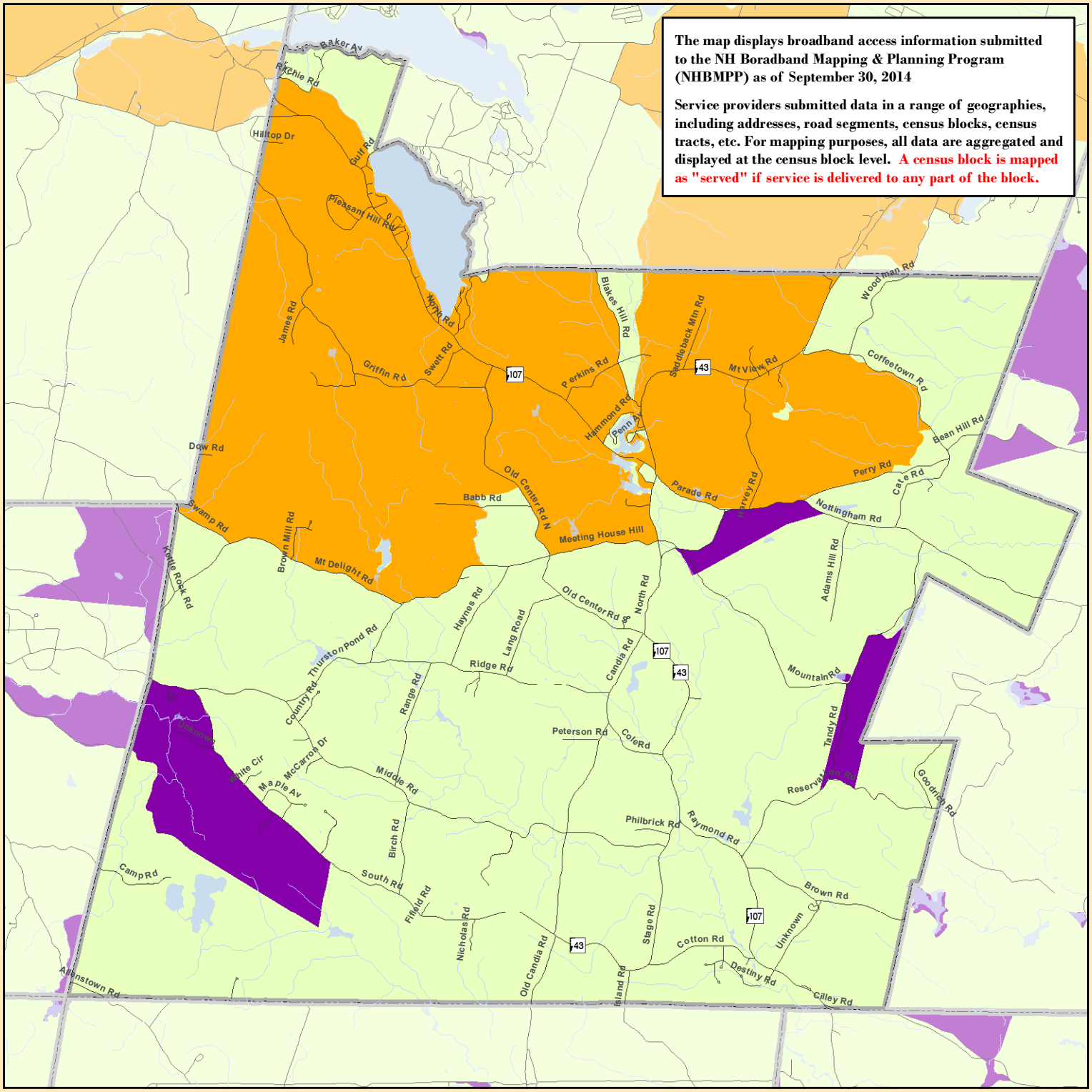
The map displays broadband access information submitted to the NH Boradband Mapping & Planning Program (NHBMPP) as of September 30, 2014
Service providers submitted data in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.
Baker Av
Ritchie Rd
Hilltop Dr
Gulf Rd
Pleasant Hill Rd
James Rd
North Rd
Griffin Rd
Swett Rd
107
Perkins Rd
Blakes Hill Rd
Saddleback Mtn Rd
43
Mt View Rd
Woodman Rd
Coffeetown Rd
Bean Hill Rd
Hammond Rd
Penn Av
Dow Rd
Old Center Rd N
Babb Rd
Parade Rd
Harvey Rd
Perry Rd
Cate Rd
Nottingham Rd
Swamp Rd
Brown Mill Rd
Mt Delight Rd
Meeting House Hill
Kettle Rock Rd
Adams Hill Rd
Old Center Rd S
North Rd
Haynes Rd
Lang Road
Thurston Pond Rd
Country Rd
Ridge Rd
Range Rd
Candia Rd
107
43
Mountain Rd
Tandy Rd
Peterson Rd
Cole Rd
Middle Rd
McCarron Dr
White Cir
Maple Av
Goodrich Rd
Philbrick Rd
Raymond Rd
Birch Rd
South Rd
Camp Rd
Fifield Rd
Nicholas Rd
Old Candia Rd
Island Rd
Stage Rd
Cotton Rd
Brown Rd
Unknown
107
Destiny Rd
Cilley Rd
Allenstown Rd
43
New Hampshire Location Map
Map # 2 A
Commercial & Residential Broadband Availability
Town of Deerfield, NH
Technology with Fastest Reported Download Speed
Cable
Optical Carrier / Fiber to the End User
Terrestrial Mobile Wireless
N
0
0.5
1
2
Miles
Data Source:
GRANIT digital Data (1:24.000)
Southern NH Planning Commission
NH Department of Transportation
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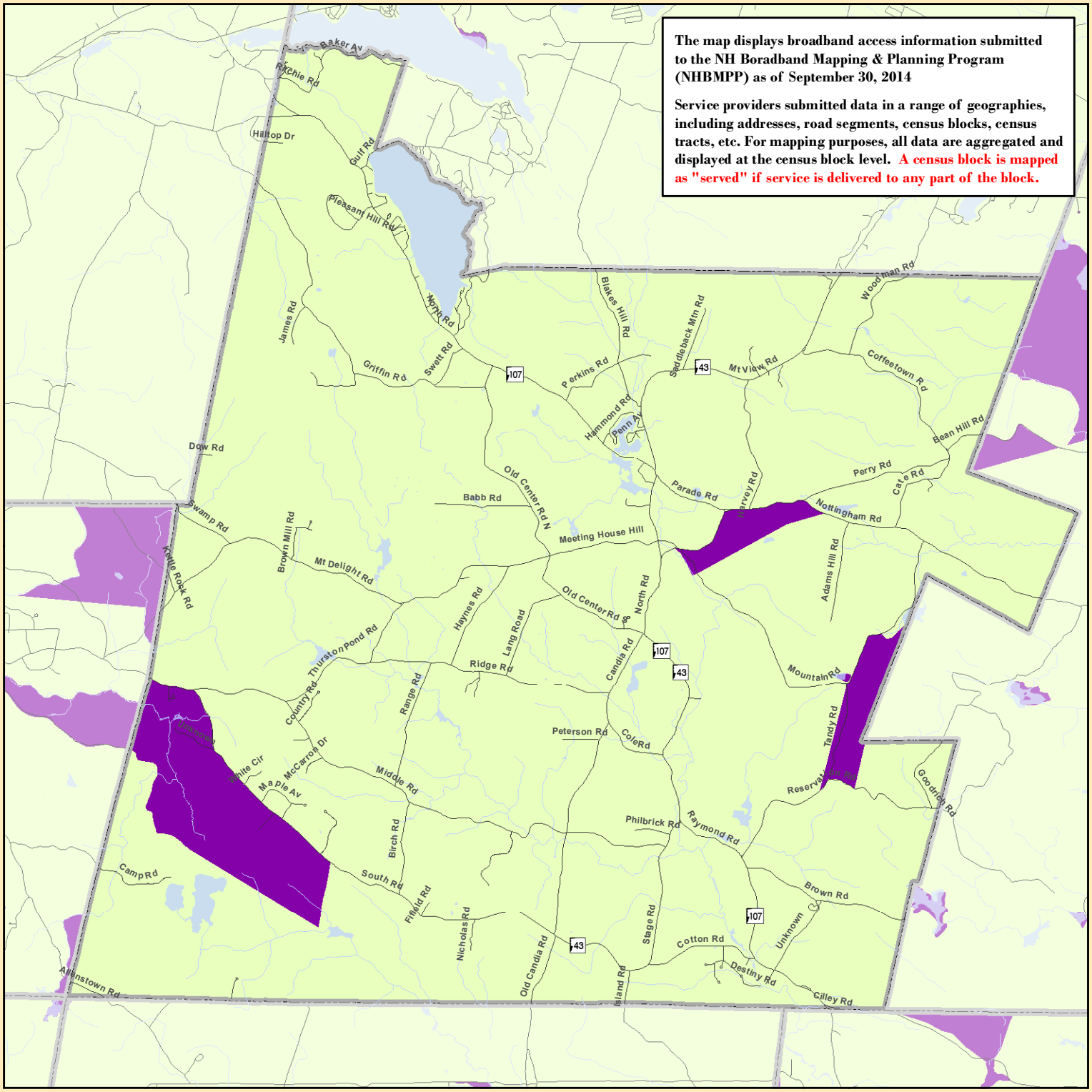

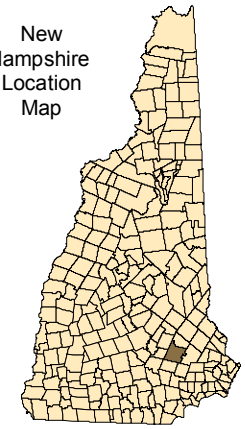

Map # 2 B

Residential Broadband Availability

Town of Deerfield, NH

Technology with Fastest Reported Download Speed

- Cable
- Terrestrial Mobile Wireless

0 0.5 1 2 Miles

N

Data Source:
GRANIT digital Data (1:24.000)
Southern NH Planning Commission
NH Department of Transportation
US Census Bureau

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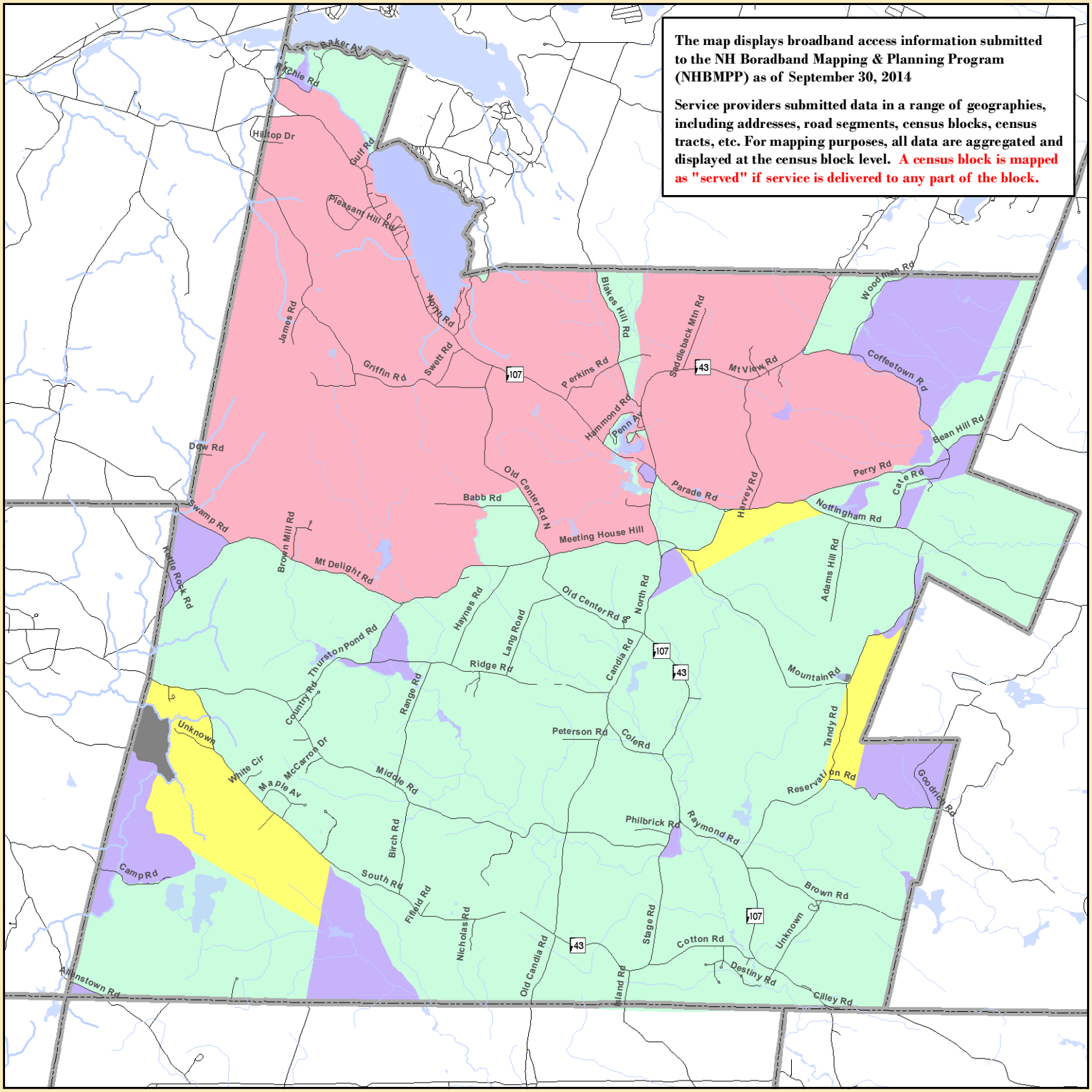
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Coffeetown Rd
Bean Hill Rd
Hammond Rd
Penn Av
Dow Rd
Old Center Rd N
Babb Rd
Parade Rd
Harvey Rd
Perry Rd
Cate Rd
Nottingham Rd
Swamp Rd
Meeting House Hill
Brown Mill Rd
Mt Delight Rd
Rattle Rock Rd
Adams Hill Rd
Haynes Rd
Old Center Rd S
North Rd
Thurston Pond Rd
Lang Road
Ridge Rd
Candia Rd
107
43
Mountain Rd
Country Rd
Range Rd
Unknown
Peterson Rd
Cole Rd
Tandy Rd
White Cir
McCarron Dr
Maple Av
Middle Rd
Reservation Rd
Goodrich Rd
Philbrick Rd
Raymond Rd
Birch Rd
Camp Rd
South Rd
Brown Rd
Fifield Rd
Nicholas Rd
Stage Rd
107
Cotton Rd
Unknown
43
Old Candia Rd
Island Rd
Destiny Rd
Allenstown Rd
Cilley Rd
New Hampshire Location Map
Map # 3
Service by Technology Type
Town of Deerfield, NH
Broadband Technology
DSL, Cable, Optical Carrier/Fiber to the End User (Fiber may only be available to Commercial Customers)
DSL, Cable
Cable
DSL
No Service
0
0.475
0.95
1.9
2.85
3.8
Miles
Data Source:
GRANIT digital Data (1:24.000)
Southern NH Planning Commission
NH Department of Transportation
US Census Bureau
N
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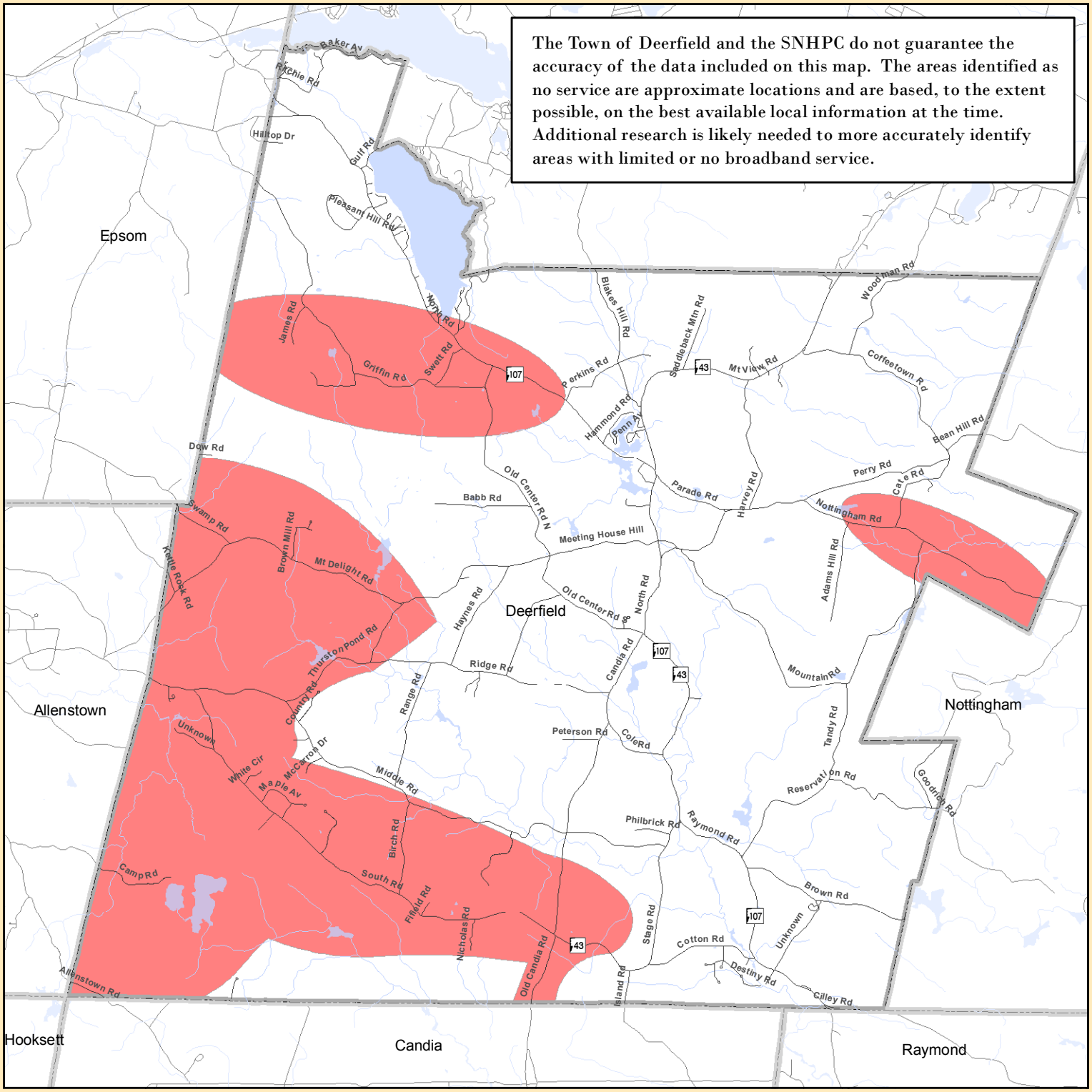
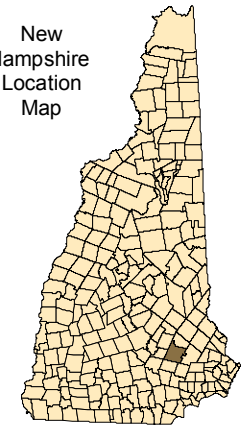
SNHPC





Map # 4

Limited or No Broadband Service

Town of Deerfield, NH

Town identifieds un-served or underserved areas

Roads

Rivers and Streams

Town Boundary

Waterbodies

0 0.5 1 2 Miles

N

Data Source:
GRANIT digital Data (1:24.000)
Town of Deerfield
NH Department of Transportation

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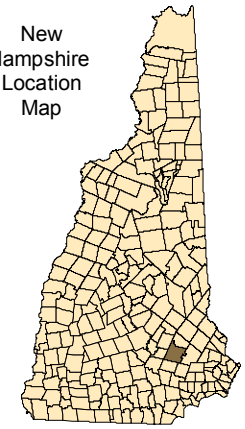
Community Anchor Institution Data collected by Southern New Hampshire Planning Commission by phone surveys. Institutions showing No Service either have no access to service or choose not to have service. Institutions showing Unknow service did not participate in the survey.



New Hampshire Location Map

Map # 5

Community Anchor Institutions

Town of Deerfield, NH

Community Anchor Institutions

School - K Through 12
- Yes
- No
- Unknown

Library
- Yes
- No
- Unknown

Public Safety
- Yes
- No
- Unknown

Medical
- Yes
- No
- Unknown

Other Community Support
- Yes
- No
- Unknown

Data Source:
GRANIT digital Data (1:24.000)
Southern NH Planning Commission
NH Department of Transportation

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0 0.5 1 2 Miles

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VI. Sector Based Analysis

Education Sector - The educational experience of today's elementary and high school students is significantly influenced by broadband-enabled resources and devices; schools in the Deerfield School District recognize the need to keep current with the demands for improved broadband connections

Today's K through 12 students need access to high-speed Internet connections both inside and outside the classroom. Some educational professionals have concerns when assigning projects that require Internet access at home because students may not have residential broadband access. Even students with access to the Internet at home can experience challenges connecting to graphic-intensive websites or downloading large files due to limited bandwidth. Inadequate broadband availability poses additional challenges for learners seeking more flexible options like online and distance learning courses and programs. Other concerns include:

- Access of high speed Internet both inside and outside the classroom.
- Need for improved and increased broadband connections at the facility or institution.
- Broadband needed for innovative teaching.
- Need to raise funds to maintain acceptable broadband standards

Many schools are using the "blizzard bag" approach for snow days which include homework that requires high-speed Internet connections. Recently, School Administrative Unit (SAU) # 45 (Moultonborough) received Dedicated Internet Access (DIA) fiber service through TWC and upgraded its service to 150 Mbps upload and download, which will be sufficient for the present time being. SAU # 45 implemented an online learning management system named Schoology. When it becomes fully operational, the system will allow students to access course information at any location. Many SAUs are headed in that direction.

The Deerfield schools have 350 computers with many additional staff and student personal devices on the wireless network. The online testing, library, cafeteria, accounting, professional development and grading/student information systems are all online. Every student in the building has and most use a school Google account. Many of the teachers use video extensively. When the School District changed from 30/10 to 30/30 broadband speed in 2013 it was because sites were timing out before they were opened and there was not enough capacity to stream video while doing other online work without dropping connections. The School District is hoping to increase to 100/100 broadband speed to solve this problem, hopefully at the end of the 2014 or early 2015. The School District has 14 wireless access points and these need to be updated and added onto to meet the increasing wireless needs.

Economic Development Sector - As noted previously, in today's environment high quality and high speed broadband and Internet service is critical for normal business applications and functions and also for economic development in Deerfield.

Businesses with high quality and reliable service can be advocates or "ambassadors" to prospective businesses considering the region. Residents working from home need access to reliable residential broadband service that is capable of performing tasks such as large data transfers, videoconferencing, and remote computing. Nationally, many businesses are adopting the practice of telecommuting, which involves employees working remotely from home using a computer. In rural Danbury (population of 1,164), a young professional lives and telecommutes for a large international investment bank on Wall Street. Since high speed service is not available at his home, he rents a small office in the village center near the US Route 4 and NH Route 104 intersection. This small investment saves his company about $150,000 a year by not requiring office space in downtown Manhattan.

In conclusion, long term regional economic growth and vitality is dependent on the capacity of businesses and institutions to keep pace with rapidly evolving technology.

Public Safety Sector - In today's digital age, there are a suite of broadband-enabled devices and technologies that can be used to enhance channels of communication among public safety and emergency management officials; however, in order for these tools to be effective, ubiquitous and reliable high performing broadband is often necessary.

Mutual Fire Aid Associations use Mobile Data Terminals to enable each apparatus to be GPS tracked. This includes fire trucks, ambulances, law enforcement patrol cars, Emergency Management Services (EMS) vehicles and others. The ability to enable a dispatcher to coordinate each vehicles arrival based on what is needed and when, in order to maintain the highest level of efficiency. In police patrol situations knowing the cruiser's locations can save valuable seconds by being able to choose the closest car to the scene in order to reduce response time. This same technology could be used to provide firefighters with the layout of the home or building prior to arriving at the scene. Another potentially life-saving use for MDTs using broadband capability is in ambulances where EMTs could use it to send defibrillator readouts directly to the hospital while in transit rather than having to rely in unreliable cellular service as they have to now.

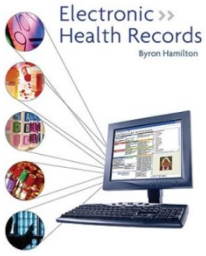
New Hampshire presents many unique situations to emergency responders. Broadband technology could greatly increase efficiency by aiding in mutual aid efforts.

There is also the need for increased service in the underserved mountainous areas where cell service is nonexistent. Every year there are several search and rescue missions throughout the mountains of New Hampshire; in those situations, communication is critical. Wireless broadband systems (SafeNet) can keep search and rescue officials in contact with fellow searchers, and the search pilots in the skies above.

Universal broadband access would enable emergency medical technicians to share information digitally and in real time to hospitals and emergency facilities from the ambulance or point of response.

First Net, a nationwide telecommunications initiative, will provide fire, police and EMS with new capabilities to do live streaming of events in real time and to simulcast events.

Health Sector - In recent years, health care facilities have experienced an increased reliance on broadband-supported devices and applications to perform and streamline administrative functions such as billing, record keeping, and data management. The most important use of the Internet identified by those interviewed is managing Electronic Health Records (EHR)[7]. EHR software, which is web-based, is an important aspect of health and human service agency operations. It enables providers to securely store and manage health records and to share information across different health care settings.



Since January 2014, digital record-keeping is required of public and private healthcare providers as part of federal mandates enacted by the Affordable Care Act. Currently, any health care provider funded through the state is required to maintain EHR. Unreliable broadband connections and lack of bandwidth impact the ability of offices to connect to EHR software systems. There is a need to keep up to date with technology and to support upgrades to this software. The privacy of health records is a very important concern.

Advances in telecommunications technology have significantly enhanced the ability of the medical sector to expand access to health care. A myriad of technology solutions are available for health specialists to communicate with and deliver services to patients, clients, and colleagues via nontraditional channels such as videoconferencing, remote patient monitoring[8], and 'cloud-based' digital medical imaging. These innovations are driven by the need of the medical sector to decrease costs through operational efficiencies while expanding access to and improving quality of care. Telehealth, the delivery of health-related services over telecommunications technologies, is dependent on adequate broadband availability throughout the state. However, widespread and adequate broadband availability is needed for telehealth, which is the delivery of health-related services over telecommunications technologies, to be successful in the Region.

Electronic health information exchange (HIE) allows doctors, nurses, pharmacists, other health care providers and patients to appropriately access and securely share a patient's vital medical information electronically—improving the speed, quality, safety and cost of patient care.

[7] Electronic Health Records is a digital record of health related information about a patient that can be shared across different health care settings via information networks or exchanges.
[8] Remote patient monitoring, also called homecare telehealth, is a type of ambulatory healthcare that allows a patient to use a mobile medical device to perform a routine test and send the test data to a healthcare professional in real-time.

Despite the widespread availability of secure electronic data transfer, most Americans' medical information is stored on paper—in filing cabinets at various medical offices, or in boxes and folders in patients' homes. When that medical information is shared between providers, it happens by mail, fax or—most likely—by patients themselves, who frequently carry their records from appointment to appointment. While electronic health information exchange cannot replace provider-patient communication, it can greatly improve the completeness of patient's records, (which can have a big effect on care), as past history, current medications and other information is jointly reviewed during visits.

Appropriate, timely sharing of vital patient information can better inform decision making at the point of care and allow providers to

- Avoid readmissions
- Avoid medication errors
- Improve diagnoses
- Decrease duplicate testing

Many doctor's offices now have web-based access to patient's reports, test results and medical history. They also provide means to contact their doctors and to make appointments.

Local Government/Community Support Sector - Certain matters are best handled through face-to-face contact and technology should augment New Hampshire's tradition of accessibility to the public process. But citizens have come to desire, and sometimes expect, a certain level of online interactivity with government and community support organizations. Most towns in New Hampshire currently host websites providing immediate, remote access to public notices, events calendars, applications, forms, ordinances and regulations. While constituents benefit from easy access to the information they need, governments and community support organizations save time, money and resources when routine requests are handled online.

Real Estate Sector

The economic impact of broadband penetration has been studied but not that of fiber-based internet access. Data from the National Broadband Map, the recent Broadband Brief by the Department of Commerce's National Telecommunications & Information Administration and the Economics and Statistics Administration confirmed that "broadband is less available in rural areas than in urban areas. The analysis also showed that proximity to central cities within a Metropolitan Statistical Area (MSA) is likely to be more strongly associated with the availability of the highest speed levels of broadband service then population density. Early studies show that people are willing to pay more for real estate located in areas where fiber is available then for a property that does not offer this amenity. A study by RVA LLC, a market research and consulting firm, found that a fiber connection adds between $5,300 and $6,450 to the value of a home. And, another study by the University of Colorado, Boulder showed that the availability of fiber broadband might be as important in explaining spatial variation in housing prices as the

cooling capability/air conditioning, fireplaces or a pool. The study showed that the presence of fiber-based broadband was associated with a positive effect on property values in the neighborhood (The Impact of High-speed Broadband Availability on Real Estate Values: Evidence from United States Property Markets, University of Colorado at Boulder, August 2013).

CHALLENGES AND OPPORTUNITIES FOR REGIONAL BROADBAND IMPLEMENTATION

The following is a list of political/regulatory, economic, social, and technological barriers related to commercial and residential broadband in the region.

Political/Regulatory Barriers

Regulatory Concerns - Cable/Internet providers do not fall under the purview of the NH Public Utilities Commission. Broadband providers prefer not to be regulated as a utility by the Public Utilities Commission. While cable TV access franchises are subject to negotiated agreements with individual municipalities, the broadband/Internet component of the service is not part of formal franchise service negotiations.

Deployment Difficulties – Many consider deployment to certain rural remote areas to be cost-prohibitive. Securing pole attachment rights is costly and sometimes abetted by competitive conflicts.

Cable Franchise Agreements - An impediment to increased competition (and thus service and choices) may be related to Cable Franchise Agreements (CFA). Alternative broadband providers are often in direct competition with cable providers under agreement with municipalities. Some municipalities are gaining experience when it comes to negotiating Cable Franchise Agreements, and are becoming proactive in improving local service. A CFA can be with a telephone company such as FairPoint.

Economic Barriers

Inadequate Access for Commercial Applications - The level of service required by technologically demanding business in the foreseeable future could potentially outstrip the planned build-out of broadband services which could lead to stagnant economic conditions.

Economic Constraints – The capital investment required to provide broadband service in areas with low population densities may not be economically feasible for the private sector because the return on investment is too low. In these cases, public funding will likely be needed. Additionally, some providers appear to be focusing on expansion of metered wireless broadband services rather than wired broadband, indicating it may be the more lucrative investment. Alternative economic models (e.g. municipal or neighborhood association financing) to provide last mile connections exist but some existing providers discourage this approach.

Social Barriers

Complacency – As noted in the 2013 UNH survey, respondents indicated the region is adequately served and prepared for the future. Throughout the planning process, the SNHPC has noted a lack of concern about broadband access among the general resident population. The perception is that, by and large, broadband access and speed are adequate. However, some communities as Moultonborough, NH have been proactive in working to enhance service.

Age – Some of those within the aging population have not adopted the changes that the Internet has brought to society over the past 20 years. As government, healthcare and businesses shift to the use of Internet applications, those without sufficient Internet access or knowledge will be left behind.

Technological Barriers

Infrastructure Information - In order to understand future network expansion, the large commercial broadband users need to understand the existing broadband infrastructure, and its ability to meet future needs. There is a desire to have better information relating to the location of broadband backbone infrastructure as well as existing and potential bottlenecks. This information is available from public providers but is considered proprietary by the private providers and unavailable to planning agencies or users. If there were regulation of the industry, or if service level agreements became part of commercial delivery business models, the information might be available and service might be provided.

The following are potential opportunities:

- *Public/Private Partnerships* **–** Prepare a guidance document to help communities and neighborhoods understand the potential to partner with service providers to extend lines into underserved areas of the community. A revolving loan grant program may support such an initiative.

- *Service Expansion Grants:* Explore grant opportunities to extend service/capabilities in underserved neighborhood/communities.

- *Regional collaboration:* Bundle a larger numbers of users to leverage increased investment and responsiveness from existing service providers to enhance their offerings.

- *Publish Accurate Service Maps:* Precise service maps may show providers the potential savings by displaying accurate service regions (less wasted advertising to areas with no infrastructure), provide customers with information on the extent (or lack of) service. Internet capacity is increasingly a feature that impacts property values and choice.

- *Community Master Plans:* Develop a broadband-specific chapter for local and regional master plans to help with understanding of zoning for broadband infrastructure and awareness of broadband as critical infrastructure for economic development and quality of life. This will help to maintain consistency and to share innovative ideas.

- *Legal reform:* Identify regulatory issues, such as pole attachment, fixed wireless antenna placement and shared radio frequency rights, then work to resolve those issues within communities where possible.

- *Local Technical Assistance:* Develop a regional informational package for municipalities to help local decision makers better understand how to foster broadband improvements through franchise agreement and other means**.**

- *Broadband Technological Opportunities Program (BTOP):* Ensure there is availability to expand or ensure there is adequate coverage of business quality broadband infrastructure, including regional access to fiber capacity implemented through the NH BTOP and others.

VII. Issues, Conditions and Actions

The overall Town of Deerfield Goal is to improve the availability and capacity of Broadband in order to bolster and enhance the Town's economic development potential and overall quality of life. In summary, in the Town of Deerfield for residential uses, cable is the most common provider, with DSL handling more rural areas and those wishing lower cost solutions. Fixed wireless may address some of the gaps, but it is difficult to attract new providers due to regulatory and business issues. And, the lack of broadband and high speed Internet service affects the marketability and real estate value of property.

It is recommended that the Town of Deerfield establish a broad goal of 100% availability and work with member municipalities and UNH Granit to maintain an inventory of areas that lack service or are underserved, create GIS layer maps which show where business grade broadband services are available, create links to provider contacts on the Town website, leverage federal and state funding to provide local and regional services and include the availability of broadband as a component on property assessment records

A. Implementation strategies and action steps

Some implementation strategies and actions steps that could be taken are:

1. Encourage Broadband as an Economic Development Tool

2. Expand the Access of Affordable Broadband Service

- Develop program to offer affordable Internet and access to underrepresented populations, veterans, home-based business owners and households living in remote rural areas of the Town.

3. Educate Businesses and Citizens on the Use of Broadband
- Recognize the important role UNH Cooperative Extension (UNHCE) plays in assisting businesses and citizens in understanding the importance of broadband. Use UNHCE for technical assistance when the opportunity arises.
- Expand and develop opportunities for education around broadband use.

4. Continue the Broadband Committees & Stakeholder Groups
- Continue the Town Broadband Stakeholders Group (BSG) Committee so local officials can be knowledgeable of the changing broadband environment.

5. Encourage Planning Board to include a Broadband Chapter in Master Plans
- Encourage Town of Deerfield to create and adopt broadband components in the Master Plan or a separate broadband chapter.

6. Encourage Dedicated Funding Sources for Expansion of Broadband
- Promote establishment of dedicated funds for broadband at the municipal level. For example, the Town of Moultonborough established Community Technology Fund six years ago, which has grown to in excess $100,000. With funds from the cable franchise fee, the Technology Fund can invest in broadband infrastructure improvements.

7. Continue Mapping & Data Collection Efforts
- Support continuation and improvements of the NH Broadband Mapping program efforts to collect, analyze and map broadband information from providers and Community Anchor Institutions across the state.

8. As Critical Infrastructure Ensure the Resiliency of Broadband Infrastructure

- Ensure that existing and new broadband infrastructure is resilient and redundant.
- Encourage inclusion of broadband in hazard mitigation or recovery planning as part of a local emergency response plan.
- Consider legislative measures to help pay for universal access such as the Universal Service Fund of 1996 for telephone service.

B. Recommendations

The following recommendations are action steps that can be taken now and in the near future to improve broadband access in the Town of Deerfield. Some of the recommendations will be easier to implement than others which require greater state and federal government involvement. However, all the recommendations are tools that can be used to reduce barriers to broadband access and make Deerfield more economically competitive and improve the quality of life for all the town's residents, businesses, and visitors.

Identify Broadband Issues and Needs

The Town of Deerfield has in place cable and DSL broadband services covering the majority of the community, while terrestrial fixed and mobile wireless services provide minimal access to extremely rural locations. The lack of sufficient broadband download speeds is a major disadvantage within the community and the community's future economic growth and development. To improve the provisions of these services, the Town of Deerfield should do all it can to promote and facilitate state/private broadband programs and initiatives to expand these technologies within the community. As discussed earlier in the chapter, programs such as the NH FastRoads program assist in building connections between the middle mile and last mile network that aggregates demand in much of the state, including community anchor institutions, large and small businesses, government offices, and residents. The routes provide fiber connections to businesses and residents, where many residents in Deerfield are limited to wireless or no connection at all.

Future Growth/Technologies/Considerations

The technology and techniques for providing fast, reliable internet service are constantly changing. It is important to remain aware of these emerging technologies and the potential infrastructure, zoning, and planning challenges they might create.

Terrestrial fixed wireless internet sources such as WiFi are transmitted through radio waves and require no cable connections or hookups and less physical infrastructure than DSL or cable. Terrestrial mobile wireless internet, which can be accessed by mobile electronic devices like smart phones, has become increasingly popular. Like fixed wireless internet, mobile requires little in the way of physical infrastructure. However, it is limited by the provider's service range, typically slower connection speeds, small screen sizes and limited operability compared to a PC or laptop.

Satellite internet, as its name suggests provides service through satellites orbiting the Earth. Like wireless, this method of delivery requires little terrestrial infrastructure but at its current stage of development has many limitations. Satellite internet has the potential to become a more viable internet delivery option in the future as the technology associated with it improves. Currently, it is used mainly by those who do not have access to DSL or cable lines.

Fiber optic cables, which deliver information using pulses of light through optical fiber, are becoming an increasingly popular method of high speed internet delivery. Able to deliver higher bandwidths of information over longer distances than DSL or cable, fiber optics should become more and more common in the future. However, there will be significant last mile delivery problems associated with fiber optics, even more so than currently exist with DSL or cable, as entirely new lines will have to be laid to the homes and businesses of end users.

Broadband over Power Line (BPL) is another emerging technology. It delivers broadband over the existing electric power distribution network, so there is little need in the way of added infrastructure or extending lines and has speeds similar to those currently found in DSL and cable modems. Today BPL is only available in a very limited number of areas but it has the potential to bring high-speed internet access to anyone connected to the electrical grid.

Action Recommendations:

	Board of Selectmen	Planning Board	School Board
Through zoning and land use policies and regulations the Town can work to concentrate new residential and commercial development in a compact nature near existing broadband infrastructure. This may require easing lot size requirements in some areas. However, it will allow for cost effective and efficient connection of those residents and businesses in town that desire or require reliable broadband access.		X	
Through zoning and development regulations provide incentives for last mile deployment in unserved and underserved areas and work with broadband vendors to identify and improve barriers to last mile access.		X	
Work with the state broadband program and SNHPC to develop and implement streamlined broadband permitting standards to facilitate the provision of fixed wireless broadband facilities and services within the community (see following zoning ordinance recommendations).	X	X	
Utilize the data and GIS maps in this chapter and from other sources to identify areas of critical concern for broadband access.	X	X	
Continue to research opportunities for grant funding for expansion of broadband infrastructure at the state and federal levels.	X		
Support continued efforts to provide critical community anchor institutions such as the library, schools, and the town hall with faster, more reliable broadband connections.	X		X
Solicit and collect feedback from citizens and businesses as to the status of their broadband access.	X		
Develop broadband and digital literacy awareness programs in the community.	X		X
Amend local ordinances and regulations that hinder the expansion of broadband infrastructure.		X	
Streamline and reduce barriers to the wireless facility siting process.		X	
Request telephone and electric utilities to improve utility pole access for broadband availaibity.	X		
Work with the State to remove rights of way (ROW) access barriers for broadband facilities.	X		
The Town can consult the 2008 New Hampshire Broadband Plan and the 2010 National Broadband Plan for additional opportunities.	X	X	X
The Town can also actively participate in the continued planning and mapping efforts of NHBMPP.	X	X	X
Town of Deerfield can consider the adopting a zoning amendment to the town's wireless telecommunications ordinance (see below).	X	X	

Local Ordinance and Suggested Amendments for Broadband Infrastructure

The design of a Municipal Fixed Wireless Broadband Facility Ordinance should be considered to provide a mechanism to allow fixed wireless broadband facilities (which include towers, relay sites and antenna array). This could either be performed through an expanded permitting mechanism from the community's wireless telecommunications facility ordinance or a separate broadband ordinance (Refer to Appendix A for Sample Ordinance).

In addition to the permitting process, minor revisions to the Deerfield Zoning Ordinance Section 329 Wireless Telecommunication Facilities Ordinance can be easily addressed to better position the Town of Deerfield in preparing and planning for enhanced broadband development within the community.

Insert the following bold italic text to read as follows:

329.3 Definitions

Antenna: Means any exterior Apparatus designed for telephonic, radio, television, personal communications service, pager network, ***high speed (broadband) internet*** or any other communications through the sending and/or receiving of electromagnetic waves of any frequency and bandwidth.

Telecommunications Facilities: Means any antenna, tower or other structure intended for use in connection with the transmission or reception or radio or television signals, or ***high speed (broadband) internet*** or any other electromagnetic transmission/receptions.

Appendix A

Sample Broadband Ordinance – Sharon, NH

ARTICLE XXII: Broadband Facilities

A. Purpose:

This article has been enacted in order to establish guidelines for regulating the installation of facilities for enhanced broadband services and fulfill the following goals:

1. Preserve the authority of the Town of Sharon to regulate and provide reasonable opportunity for the siting, construction and maintenance of broadband services without cost to the town, or adjacent property owners, either directly or indirectly.

2. Reduce the adverse impacts such facilities may create on, including, but not limited to: migratory bird flight corridors, impacts on aesthetics, environmentally sensitive areas, historically significant locations, health and safety by injurious accidents to person and property, and diminution of property values.

3. Preserve Sharon's unique viewsheds, visual beauty, rural character, sensitive natural environment and scenic values, in particular those associated with Temple Mountain.

Regulations relating to Telecommunications Facilities (commonly known as cell towers and cell phone antennas) are covered in Article XXI: Telecommunications Facilities.

B. Definitions:

Average Tree Canopy Height: Means the average height found by inventorying the height above ground level of all trees forming the canopy within a radius of one hundred and fifty feet (150'). Canopy height is determined utilizing the Forest Ecosystem Rapid Assessment Scorecard (FERAS)

Compound: Means the tower site and includes any and all accessory structures and exposed equipment, including security fencing.

Existing Structure: Means a residential or commercial building, barn, silo, water tower, public utility transmission power pole, tower or other similar structure where fixed wireless broadband technology is to be deployed.

Fixed Wireless Transmitter Tower Structure: Means a structure that supports one or more antenna(s) that receives and transmits fixed wireless signals to provide subscribers with high-speed (broadband) internet access capabilities.

Fixed Wireless Transmitter Antenna Array: Means any series of antenna or array of antennas that receives and transmits fixed wireless signals to provide subscribers with high speed (broadband) internet access capabilities.

Over-the-Air Reception Devices (OTARD): Federal Communications Commission adopted the OTARD rule in 1996 (47 C.F.R. Section 1.4000). OTARD rules as amended in 2000 prohibit restrictions on property that impair the use of certain antennas. The rule applies to customer-end antennas serving customers on the premises that transmit and/or receive fixed wireless signals. Fixed wireless signals are defined to be any commercial non-broadcast communications signals transmitted via wireless technology to and/or from a fixed customer location.

C. Permitted Uses

Amateur Radio: The installation or use of a tower and/or an antenna less than seventy feet (70') in height which is operated and used exclusively by a federally licensed amateur radio station operator is not subject to the provisions of these Regulations

Essential Services & Public Utilities: Fixed Wireless Broadband Facilities shall not be considered infrastructure, essential services, or public facilities, as used elsewhere in the Town's ordinances and regulations. Siting for fixed wireless broadband facilities is a use of land, and is addressed by this regulation.

D. Construction Performance Requirements:

Federal Requirements: All Facilities must meet or exceed current standards and regulations of the Federal Aviation Administration (FAA), Federal Communications Commission (FCC), and any other agency of the federal government with the authority to regulate such Facilities. If such federal standards and regulations are changed, the owners of Facilities governed by this Article shall achieve compliance within six (6) months of the effective date of the changes, unless a more stringent compliance schedule is mandated by the controlling federal agency. Failure to bring facilities into compliance with any changes in federal requirements shall constitute grounds for the removal of the tower or antenna at the owner's expense, in accordance with Section H herein below through execution of the posted security.

Building Codes/Safety Standards: To ensure the structural integrity of towers and antennas, all facilities shall be inspected to determine structural safety every year by a licensed engineer approved by the Town, with the cost to be paid by the owner. The engineer will submit a report to the Town. If the report concludes that a tower fails to comply with all applicable codes and standards and constitutes a danger to persons or property, the owner will receive notice to bring such tower and/or antenna into compliance with such codes and standards within thirty (30) days of receipt of such notice. If the owner fails to comply within thirty (30) days, such action shall constitute an abandonment and grounds for the removal of the tower or antenna, in accordance with Section H herein, at the owner's expense through execution of the posted security.

1. Fixed Wireless Transmitter Tower Structures: These requirements shall supersede any and all other applicable standards found elsewhere in Town Ordinances or Regulations that are less strict.

a. Height: Facilities shall be erected and maintained at the lowest feasible height. In no case shall the height of any Facility exceed thirty-five (35) feet above the Average Tree Canopy Height, or one hundred (100) feet above ground, whichever is greater.

b. Setbacks and Separation: In addition to compliance with the minimum zoning district setback requirements for all structures, towers shall be set back a distance equal to 125% of the height of the tower from all property lines. For locations adjacent to wetland, there shall be a setback of at least one hundred (100) feet from the boundaries of the wetlands conservation district.

c. Security Fencing: Towers shall be enclosed by security fencing not less than six (6) feet in height and be equipped with appropriate anti-climbing devices. Any accessory structure shall be situated fully within twenty feet (20') of the tower and within the fenced area.

d. Landscaping: A buffer shall be provided and maintained that effectively screens the view of the compound from adjacent residential property. The standard buffer shall consist of existing indigenous vegetation within the setback required in paragraph 2 above. Existing vegetation and natural landforms on the site shall be preserved to the extent possible. In some cases, such as towers sited on large wooded lots, natural growth around the property may be deemed a sufficient buffer.

e. Camouflaging:
i. At a tower site, the design of the buildings and related structures shall, to the maximum extent possible, use materials, colors, textures, screening, and landscaping that will blend the tower facilities with the natural setting and built environment.
ii. If an antenna is installed on a structure other than a tower, the antenna and supporting electrical and mechanical equipment must be of a neutral color that is identical to, or closely compatible with, the color of the supporting structure so as to make the antenna and related equipment visually unobtrusive.

f. Balloon Test: For the siting of any tower or similar structure, the applicant shall provide notice of a date on which a balloon (or balloons) will be floated at the proposed site, and provide photographs from locations specified by the Planning Board ("Board"). All towns within twenty (20) miles of the proposed location will be notified of the test, by certified mail, to be paid by the applicant. A notice will also be posted in a newspaper of general circulation within such municipalities. Such notice shall be published not less than seven (7) days nor more than twenty-

one (21) days prior to the public hearing date. The test will be continued for a minimum of three (3) hours and if cancelled or delayed by inclement weather, such as limited visibility or wind velocities above ten (10) miles per hour, the test will be re-scheduled and re-noticed, as detailed above

g. **Fall Zone:** In order to insure public safety, no structures (other than those within the compound) shall be within an area of setback, as detailed in paragraph 2 above.

Fixed Wireless Transmitter Antenna Array may be located on an existing structure in any zoning district, but may not exceed five (5) feet above the existing structure. Before attaching any fixed wireless transmitter antenna array technology to any public utility transmission towers or poles a written request must be submitted to the Board of Selectmen and obtain the Selectmen's written approval. The applicant shall provide any and all information or documents requested. The written approval shall be subject to such conditions as the Selectmen may require. Before attaching fixed wireless transmitter antenna array to any existing residential or commercial building, governmental building, barn silo or other similar structure an application for a Conditional Use Permit shall be submitted to the board as set forth in Section E hereunder.

If an antenna is installed on the exterior of a structure other than a tower, the antenna and supporting electrical and mechanical equipment must be of a neutral color that is identical to, or closely compatible with, the color of the supporting structure so as to make the antenna and related equipment visually unobtrusive.

E. Conditional Use Permits:

General: Fixed Wireless Transmitter Tower or Antenna Array are permitted upon obtaining from the Board a Conditional Use Permit (excluding those attaching to public utility transmission towers and approved by the Board of Selectmen). All such uses must comply with other applicable ordinances and regulations of the Town of Sharon, except for those specifically noted herein. The applicant shall use the form of Application for Fixed Wireless Transmitter Tower and Antenna Facilities as provided by the town. Request for waivers from the application (Section F) must be made in writing, noting the name of the project, and the date of application which request shall become a part of the application. Conditional Use Permit approval may be granted by the Board pursuant to RSA 674:21 after a public hearing. All applications for Tower Structure shall contain a scaled plan in accordance with the Site Plan Review Regulations and further information including a scaled elevation view, topography, radio frequency coverage, tower height requirements, setbacks, drives, parking, fencing, landscaping, adjacent uses (up to two hundred feet [200'] away), and any other information deemed necessary by the Board to assess compliance with this regulation. The board may decline to grant a Conditional Use Permit if the applicant does not provide sufficient additional broadband capabilities for the residents of the Town of Sharon.

Issuance of Conditional Use Permits: In granting the Conditional Use Permit, the Board may impose conditions to the extent the Board concludes such conditions are necessary to minimize any adverse effect of the proposed tower or antennas on adjoining properties, and preserve the intent of this article.

Procedure on Application: The Board shall act upon the application in accordance with the procedural requirements of the Site Plan Review Regulations and RSA 676:4. Each applicant shall pay an application fee as specified on the form of Application for Fixed Wireless Transmitter Tower and Antenna Facilities. If the Board determines that additional technical review is required, such review shall be conducted at the applicant's expense. The board will attempt to limit such expenses, but refusal by the applicant to pay for such technical assistance as the board determines to be necessary shall be grounds for denial of the permit.

The Board will consider the following factors before making a decision regarding a request for Waiver or the granting of a Conditional Use Permit:

1. The activity is a productive and reasonable use of the land and is in compliance with the purpose of this regulation.

2. Design, construction and maintenance methods are established to minimize detrimental impacts.

3. Factors that will be considered in granting decisions:
   a. Height of the proposed supporting tower structure.
   b. Mechanical safety of the structure.
   c. Compliance with Radiofrequency Electromagnetic Fields (RF) exposure guidelines.
   d. Proximity of tower structure to residential development.
   e. Nature of uses on adjacent and nearby properties.
   f. Surrounding topography.
   g. Surrounding tree coverage and foliage.
   h. Design of the tower with particular reference to design characteristics that have the effect of reducing or eliminating visual obtrusiveness.
   i. Proposed ingress and egress to the site.
   j. Visual impacts on view sheds, ridgelines, and other impacts by means of tower structure location, tree and foliage clearing and placement of incidental structures.
   k. Availability of alternative tower structures and alternative siting locations.

If the applications is for the construction of a free standing Fixed Wireless Transmitter Tower Structure, the requirements detailed under Article XX: Telecommunications Facilities, Section F Plan Requirements will apply.

Decisions: All decisions shall be rendered in writing. A denial of the Conditional Use Permit or any waivers requested by the applicant must be based upon evidence contained

in the written record. Conditions demanded by the Board will be detailed in the letter of approval and the minutes of the board.

F. Waivers:
1. Any requirement of this article may be waived or modified when, in the opinion of the Board, strict conformity would pose an unnecessary hardship to the applicant and such waiver would not be contrary to the spirit and intent of the article or that specific circumstances relative to the project indicate that the waiver will properly carry out the spirit and intent of the article.

2. The basis for any waiver granted by the Board shall be recorded in the minutes of the Board, and recorded in the decision of the board.

Conditions: In approving waivers, the Board may impose such conditions as it deems appropriate to substantially secure the objectives of the standards or requirements of this article.

Procedures: A petition for any such waiver shall be submitted in writing by the applicant for Board review. The petition shall state fully the grounds for the waiver and all of the facts relied upon by the applicant.

G. Bonding and Liability Insurance:
The applicant shall provide a surety bond or other appropriate security to the Town in an amount sufficient to cover the costs of removal and disposal of the facility components. The Board shall set the form and amount of the security. The Board shall also require the applicant to submit proof of appropriate liability insurance with respect to the proposed facilities prior to construction. The term of the bond shall be determined by the Board. The Selectmen shall administer the bond requirements. In addition, if the Board requires an engineering assessment in order to set the amount of the bond, the cost shall be borne by the applicant.

H. Removal of Abandoned Antennas and Towers:
Any antenna or tower that is not operated for a continuous period of 12 months shall be considered abandoned and hazardous to the public health and safety, unless the owner of said tower provides proof of quarterly inspections with results satisfactory to the Board. The owner shall remove the abandoned structure within ninety (90) days of receipt of a declaration of abandonment from the Town. A declaration of abandonment shall be issued only following a duly noticed public hearing in accord with Town regulations. Abutters and the last known owner/operator of the tower shall also receive notice. If the abandoned tower is not removed within ninety (90) days, the Town may execute the security and have the tower removed. If there are two or more users of a single tower, this provision shall not become effective until all users cease using the tower.

I. Administration and Enforcement:

It shall be the duty of the Board of Selectmen, and they are hereby given the power and authority, to enforce the provisions of this article. The Selectmen may appoint an agent to enforce this article.

Upon any well-founded information that this article is being violated, the Selectmen shall take immediate steps to enforce the provisions of the article by seeking an injunction in the Superior Court or by any other legal action.

J. Appeals:
Pursuant to RSA 676:5, any decision made under this article cannot be appealed to the Board of Adjustment, but to the superior court as provided by RSA 677:15.

Adopted (date)

Appendix B

Granite State Future Survey/Public Forum Results

During May-July 2013, the University of New Hampshire Survey Center conducted a telephone survey for New Hampshire's nine Regional Planning Commissions, as part of the *Granite State Future* and *New Hampshire Broadband Mapping and Planning* initiatives. Funded in part by a grant from the U.S. Department of Housing and Urban Development, *A Granite State Future* is intended to engage New Hampshire citizens in a public dialogue at the local, regional and state levels, about what they want for the future of their communities and state. Results from the survey will inform updates to the Regional Master Plans in each of NH's nine planning regions. These regional plans are advisory documents designed to provide municipalities with data and strategies to support local decision-making, as well as to enhance regional cooperation. Results from the survey will inform the broadband plans developed in each of NH's nine planning regions.

A total of 2,935 New Hampshire adults were contacted by telephone by UNH staffers between May 9 and July 21, 2013 in conducting the survey. The overall response rate was 33 percent and the margin of sampling error for the survey was +/- 2.2 percent.[22]

Survey Results

Many of the survey responses obtained within the SNHPC Region closely mirror statewide responses; however, a select few are noted for their difference. Of prime importance, 93 percent of the region's residents report having access to the internet at home (See Table 15). Overall, the UNH Survey Center found statewide those who are 70 or older, those unemployed and looking for work, those with a high school education or less, and households earning less than $20,000 are less likely to have internet access at home. Results for the City of Manchester may differ from the region as a whole, considering the city's socio-economic characteristics, such as median household income and unemployment rates discussed earlier.

Table 15: Internet Access at Home

Do you have access to the internet at home?

Respondents	Yes	No	Don't know	Number responding
Statewide	91%	9%	0%	2925
SNHPC Region	**93%**	**7%**	**0%**	**591**

Source: Granite State Future 2013 Statewide Survey

Table 16 reveals there are several reasons why 7 percent of the region's residents do not have internet access at home, many of which are related to social preferences. 29 percent of respondents claimed they don't need the internet and 10 percent said they don't know how to use it. These answers may be related to differences between generations. Of those

[22] "NH Regional Planning Commissions: A Granite State Future, 2013 Statewide Survey." The Survey Center, UNH. September 2013.

who don't have internet access at home, 13 percent do not have a computer that can adequately handle internet connections, while 17 percent reported internet service is too expensive. Identifying and implementing strategies addressing the affordability of broadband will help decrease the number of people unable to access internet at home.

The majority of residents within the SNHPC Region utilize cable-based broadband internet (79 percent) while DSL generates the second most common type of internet connection (See Table 17). Compared to statewide types of internet connections, residents in the Southern New Hampshire Region use cable internet more. 4 percent of respondents in the region report using fixed wireless, while only 3 percent have a fiber-based connection at home.

Table 19 explores why residents use their current internet providers. The two most common responses are that it was the only provider and "other" (31 percent). About 24 percent stated that they were happy with their current service provider.

Of those respondents who knew what their monthly internet bill was, the most common price range indicated is $50-$99 (29 percent), followed by monthly internet bills exceeding $100 (28 percent) (See Table 20). A $20-$49 monthly internet bill is also fairly common, with 21 percent of respondents paying this amount. These prices are not clear if they include bundled services, which account for 79 percent of residents paying for internet services (See Table 21). The Survey Center found that statewide, households earning less than $20,000 are less likely to pay for bundled internet service.

Additionally, The Survey Center found those who are 70 or older, retired people, those with a high school education or less and households with an income of less than $20,000 are less likely to shop online. Millennials are found to be more likely to watch videos online, while conversely, those who are 60 or older are less likely to watch online videos.

With 93 percent of the region's residents having access to broadband at home, 94 percent report being pleased with their internet connection at home for their uses (See Table 26). This response rate signifies that the popularly-utilized cable internet connection serves the region's population well.

A strong majority of residents (87 percent) are uninterested in paying more per month for a faster internet connection (See Table 27). With such an overwhelming majority of respondents stating their connection is adequate, paying more for a faster connection will not yield significant benefits.

Of particular importance to local elected officials, residents were asked if they would support their municipality funding the expansion of broadband access to existing and potential development. 56 percent of respondents oppose a municipality using any funds for broadband (See Table 28). Of the 40 percent who favored the use of municipal funds for broadband, 22 percent stated they would accept higher taxes for the service, while 18 percent would prefer a different funding mechanism used other than taxes.

Tables 16 through 28 are provided on the following pages.

Table 16: Reasons for not having Internet

Which of the following is the most important reason why you don't have internet access at home?

Respondents	It is not available where I live	I have access at another place such as my job	It is too expensive	I don't know how to use it	I don't need it	I don't have an adequate computer	Some other reason	Don't know	Number respond
Statewide	5%	9%	20%	8%	26%	9%	21%	2%	262
SNHPC Region	**0%**	**5%**	**17%**	**10%**	**29%**	**13%**	**27%**	**0%**	**43**

Source: Granite State Future 2013 Statewide Survey

Table 17: Types of Internet Connections

What type of connection do you have to the internet at home?

Respondents	Dial-up	DSL	Cable	Fixed wireless	Cellular	Satellite	Fiber	Other	Don't know	Number responding
Statewide	1%	16%	68%	5%	2%	2%	2%	1%	3%	2646
SNHPC Region	**1%**	**9%**	**79%**	**4%**	**1%**	**0%**	**3%**	**2%**	**1%**	**547**

Source: Granite State Future 2013 Statewide Survey

Table 18: Why Dial-up/Satellite?

If you are on dial-up or satellite, why?

Respondents	Only available option	Too costly to change	Too much effort to change	Learning curve is too steep	I don't know what other options are available	Other	Don't know	Number responding
Statewide	26%	9%	2%	2%	2%	10%	49%	158
SNHPC Region	**0%**	**11%**	**0%**	**0%**	**0%**	**17%**	**72%**	**9**

Source: Granite State Future 2013 Statewide Survey

Table 19: Current Provider Choice

Why are you using your current provider?

Respondents	I'm happy with my current provider	Only option available	Too costly to change	Too much effort to change	Learning curve is too steep	I don't know what other options are available	Other	Don't know	Number responding
Statewide	22%	39%	5%	3%	0%	2%	23%	6%	2631
SNHPC Region	**24%**	**31%**	**3%**	**4%**	**0%**	**1%**	**31%**	**6%**	**545**

Source: Granite State Future 2013 Statewide Survey

Table 20: Monthly Internet Bill Prices

What is your monthly internet bill?

Respondents	Less than $20	$20-49	$50-99	$100 or more	Don't know	Number responding
Statewide	3%	25%	29%	24%	19%	2590
SNHPC Region	**1%**	**21%**	**31%**	**28%**	**19%**	**537**

Source: Granite State Future 2013 Statewide Survey

Table 21: Bundled Services

Do you pay for a bundled service (internet, TV, phone)?

Respondents	Yes	No	Don't know	Number responding
Statewide	76%	22%	2%	2624
SNHPC Region	**79%**	**20%**	**2%**	**545**

Source: Granite State Future 2013 Statewide Survey

Table 22: Email

Do you use the internet to check your email at home?

If Yes: Is the speed of your internet connection too slow, or is the speed of your internet connection adequate for this?

Respondents	Do not check email at home	Do, but connection is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	4%	5%	90%	1%	2622
SNHPC Region	**4%**	**3%**	**93%**	**0%**	**542**

Source: Granite State Future 2013 Statewide Survey

Table 23: Shopping Online

Do you use the internet to shop online at home?

If Yes: Is the speed of your internet connection too slow, or is the speed of your internet connection adequate for this?

Respondents	Do not shop online at home	Do, but connection speed is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	19%	5%	75%	0%	2622
SNHPC Region	**18%**	**5%**	**77%**	**0%**	**541**

Source: Granite State Future 2013 Statewide Survey

Table 24: Online Videos

Do you use the internet to watch online video, such as YouTube or Netflix at home?
If Yes: Is the speed of your internet connection too slow, or is the speed of your internet connection adequate for this?

Respondents	Do not watch online video at home	Do, but connection speed is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	37%	10%	53%	1%	2622
SNHPC Region	**32%**	**8%**	**60%**	**0%**	**542**

Source: Granite State Future 2013 Statewide Survey

Table 25: VPN

Do you use the internet to connect to other computers using VPN (Virtual Private Network) at home?

Respondents	Do not connect to other computers at home	Do, but connection speed is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	66%	4%	27%	2%	2612
SNHPC Region	**60%**	**7%**	**32%**	**1%**	**542**

Source: Granite State Future 2013 Statewide Survey

Table 26: Adequate Internet Connection?

Overall, do you consider your internet connection at home to be adequate for your uses?

Respondents	Yes	No	Don't know	Number responding
Statewide	92%	7%	1%	2630
SNHPC Region	**94%**	**5%**	**1%**	**544**

Source: Granite State Future 2013 Statewide Survey

Table 27: Paying for Faster Internet Speeds

How much more (if any) would you be willing to pay for faster internet speeds?

Respondents	Nothing	25% more per month	50% more per month	Don't know	Number responding
Statewide	85%	11%	2%	3%	2622
SNHPC Region	**87%**	**9%**	**1%**	**3%**	**543**

Source: Granite State Future 2013 Statewide Survey

Table 28: Using Municipal funds for Broadband Access

Do you favor or oppose using municipal funds to provide broadband access to existing and potential development?

If Favor: Would you be willing to pay higher fees or taxes to pay for it?

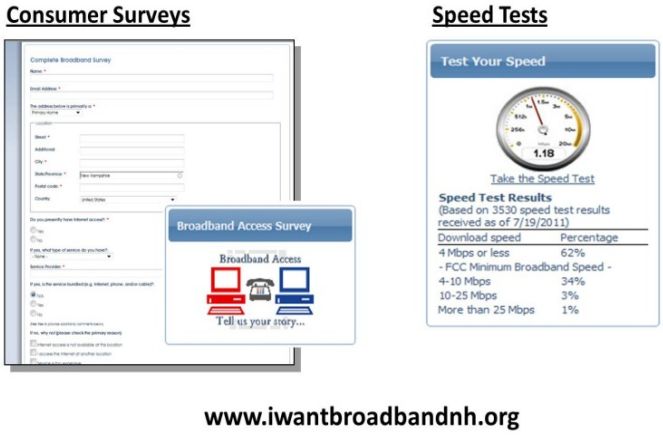
Respondents	Favor higher taxes	Favor no taxes	Oppose	Don't know	Number responding
Statewide	26%	16%	51%	6%	2910
SNHPC Region	**22%**	**18%**	**56%**	**4%**	**589**

Source: Granite State Future 2013 Statewide Survey

ii. UNH Speed Test Survey Results

In order to supplement public outreach efforts verifying local broadband service as well as advertised speeds by Internet Service Providers, the University of New Hampshire developed a speed test and a short survey for residents across the state to share. When participants selected the speed test application at www.iwantbroadbandnh.org, both download and upload speeds were measured at the reported location of the user. Table 29 displays the total number of speed test and survey participants by municipality in the SNHPC Region, as of September 2013. The most speed tests completed were in the City of Manchester and the towns of Derry, Goffstown and Bedford.

Figure 1: Speed Test Instruments



Source: www.iwantbroadbandnh.org

Table 29: Completed Speed Tests and Surveys

Municipality	Speed Tests	Surveys
Auburn	1	0
Bedford	21	0
Candia	7	0
Chester	15	0
Deerfield	16	2
Derry	71	1
Goffstown	28	2
Hooksett	5	0
Londonderry	14	2
Manchester	70	1
New Boston	6	1
Raymond	11	1
Weare	11	1
Windham	7	1
Regional Total	**283**	**12**

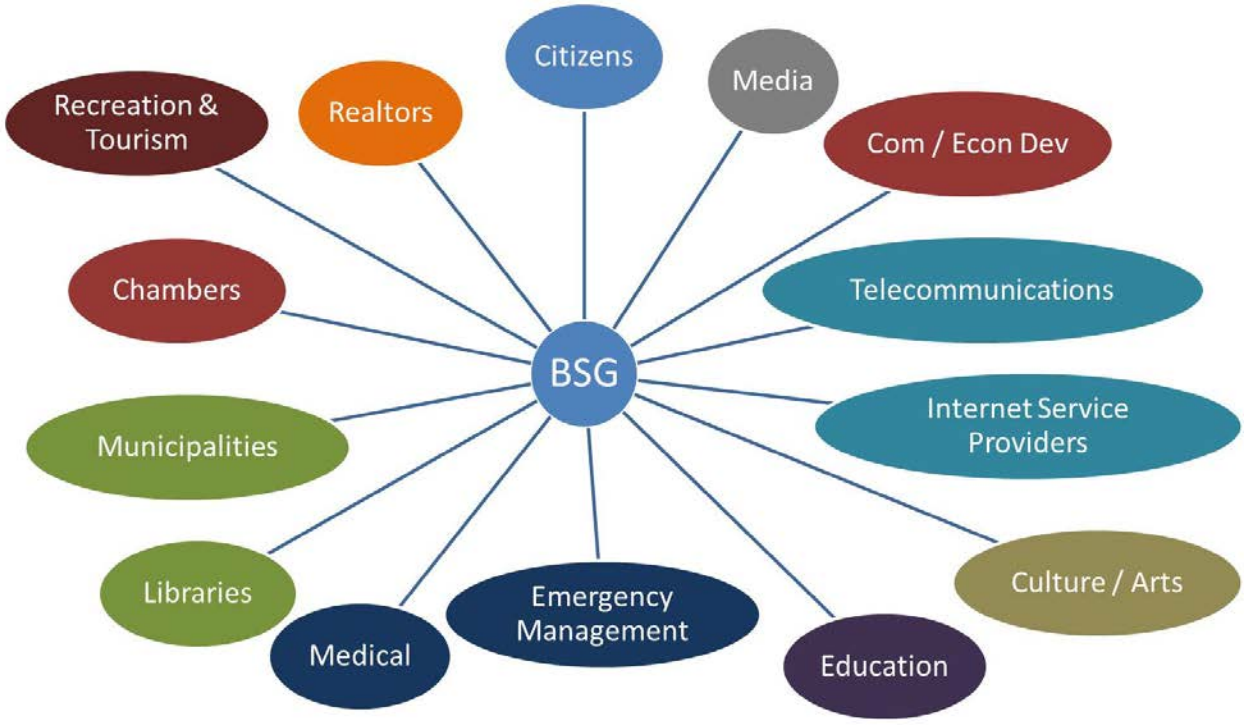
Source: New Hampshire Broadband Mapping and Planning Program, September 2013

iii. Sector-Based Analysis

Between October 2012 and February 2013, the Broadband Stakeholders Group (BSG) and the SNHPC conducted broadband surveys and facilitated a concentrated public outreach effort (Focus Group Exchanges) among the following sectors of the region:

- Business/Economic Development – held on November 7, 2012
- Health – held on November 8, 2012
- Public Safety – held on November 15, 2012
- Education – held on November 15, 2012
- Community Support/Government – held on November 20, 2012

Figure 29: Broadband Stakeholders



Source: SNHPC

The purpose of these *Focus Group Exchanges* was to provide an opportunity for public input and discussion of the region's business/economic development, health, public safety, education and community support/government broadband needs.

In addition, another public forum was held on October 3, 2013 to obtain a wider public review of this draft plan, including a specific focus on residents in the region. Existing underrepresented and lower-income households and neighborhoods were also extended invitations to attend this public forum.

Figure 3: October 3, 2013 Broadband Public Forum

Source: SNHPC

The various sector-based broadband surveys distributed by the BSG and SNHPC were prepared by staff at UNH (See Appendix F: Sector Focus Group Survey Summary). These surveys were prepared as excel spreadsheets and distributed both electronically by email and by mail to many existing businesses, companies, health organizations and hospitals, public institutions, school districts, local government facilities, libraries, etc. in all 14 communities

in the region. This survey is the first time broadband information and specific sector-based questions have been asked within the region.

In total, there were 18 returned surveys and five focus group sessions that dealt with the following topics for each of the five sectors:

- Identified needs
- most important sector needs
- technology-related challenges
- what could help overcome challenges
- future strategic plans
- broadband development in this region

Of these subjects, “Identified needs and technology related challenges” had the most consistent responses between the various sectors. Similarly, the responses to “what could help overcome challenges” had many commonalities amongst the sectors. The most common challenges and needs identified were greater monetary resources and funding, greater network redundancy, and better training and IT support.

A summary of the survey results and sector focus group exchanges is presented as follows:

a) Education

The greatest challenges identified by the education sector are the lack of sufficient funding to cover the costs of higher speed broadband services, dedicated IT staff, and keeping up with ever-changing technologies. Additional challenges include a lack of knowledge of the services available and a lack of training to keep pace with changing technologies. Many school districts throughout the region are provided free or reduced tiered pricing for broadband service as part of their municipality's cable franchise agreement. However, the broadband speed provided varies considerably from town to town depending on the service provider. While faster services may be available from the same service provider, the additional cost may not justify the increase in speed. Internet service is thus a major decision left to individual towns, and the franchise agreement with service providers. There are a total of 12 School Administrative Units (SAUs) within the region.[23] Due to the nature of the franchise agreements, each District/SAU must work cooperatively with their municipal governing board to address internet services and fees.

Figure 4: Education Sector Analysis Focus Group

Source: SNHPC

Education Sector Focus Group Attendees:

- Deb Boisvert, Deerfield Community School
- Andre Garron, UNH-CE
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

b) Health

Among the larger health institutions and hospitals, the chief concerns dealt with redundancy and data security. Redundancy at multiple levels was of key importance in the region. Having more than one connection to a fiber loop was deemed critical in maintaining constant network access, as was having connection(s) to multiple service types such as fiber, Metro Ethernet, Cable, Cellular, etc. Redundancy in power supply by means of backup generators or batteries was also described as important. Data security was another concern of the health sector since much of their data contains confidential patient information. The data must also always be available for treatment purposes. It was mentioned that cloud computing offers some advantages, but until it is proven to be at least as secure and reliable as the hospital's own system, a move to cloud computing will be a slow transition. Smaller healthcare providers face different challenges, similar to

[23] http://my.doe.nh.gov/Profiles/PublicReports/PublicReports.aspx?ReportName=SAUList. Accessed August 13, 2013.

those faced by other small businesses and organizations. These include keeping up with the fast changes in technology and limited resources.

In 2010, over 500 healthcare sites across Northern New England were awarded a $24 million grant from the FCC as part of the Rural Health Care Pilot Program (RHCPP).[24] The purpose of this program is to establish a nationwide broadband network of health care sites. The participants in New Hampshire, Maine and Vermont came together to form the New England Telehealth Consortium (NETC) with the purpose to improve the capability and efficiency of healthcare using broadband technologies among rural communities. One of the goals of the project includes developing the necessary telehealth infrastructure along with improving the transmission of electronic health records to share among healthcare sites.

Health Sector Focus Group Attendees:

- Brian Tew, Catholic Medical Center
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

c) Community Support/Government

Many of the challenges for the government and community support sectors are tied to budget constraints. This includes a lack of resources for better technology and tech support. Other technology-related challenges are limited internet speed and inconsistent service from the provider. Libraries have become popular destinations for internet access and use, as they tend to be connected to high-speed broadband networks even when the surrounding rural communities might not have connections. The creation of public Wi-Fi hotspots throughout various community locations has generated much interest.[25] The City of Manchester, through a Chamber of Commerce and private sector effort, established free Wi-Fi along Elm Street in the downtown area ten years ago. Through support of this broadband plan, the City of Manchester is involved again in pursuing a grant, with private sector partnership, in establishing a city-wide free Wi-Fi program. It is hoped that such services and greater broadband connections will attract more businesses and customers to Manchester.

A challenge unique to municipalities is negotiating cable franchise agreements. It can be difficult for a town to negotiate a contract to the town's benefit if specific expertise in this area is not available. Additionally, when pursuing other technologies via the franchise agreement, such as creating an institutional network (iNet) between all municipal and school buildings, the costs will likely require multi-year agreements which may be difficult to secure through town/school board approvals. One strategy to ensure better negotiations of such agreements has been recently implemented by several municipalities and school districts. They are working together to pool their resources to hire legal assistance specializing in cable franchise agreements, which will help them gain more

[24] New England Telehealth Consortium, http://netelc.org/about.html (accessed 3/26/14).
[25] Currently, two towns in New Hampshire, Portsmouth and Nashua, have or will implement free public Wi-Fi in their downtowns.

influence in the negotiations. Currently, only the City of Manchester in the region publicly owns the fiber backbone connecting many city facilities and departments.

Community Support/Government Focus Group Attendees:

- Brian Olsen, Bedford
- Deb Lievens, Londonderry
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

d) Public Safety

One of the concerns raised by the survey and focus group exchange is the implementation of emergency response networks. Specifically, whether to pursue a publicly-funded private network dedicated to public safety or to use a service carrier to provide bandwidth on their network. Building and maintaining a private broadband network is costly, requiring a high level of commitment, and is a community by community decision. However, it has many advantages, primarily that the entire bandwidth is dedicated for emergency response uses. Utilizing a private carrier's network would reduce the need to construct new infrastructure and future maintenance – this would be the responsibility of the provider, but it is unclear whether bandwidth would be dedicated to emergency response uses during times of emergency or if it would have to compete with other paying users.

Another concern involves coordination amongst the multiple agencies at the various levels of government in implementing an emergency response network and sharing resources and communications equipment. For redundancy purposes, there are many modes of communication that can be employed. These include fiber, microwave, cable, telephone, wireless, and HAM radio. Using a combination of these modes provides multiple options, should one or more segments of the communications network become inoperable.

Costs are a limiting factor for many municipalities' emergency response departments, limiting the speed of their broadband connection and network redundancy. Some towns, such as Bedford and Londonderry, are looking to implement wireless broadband connections between dispatch centers and emergency response vehicles, including the J1 System and RED ALERT. However, these systems can be very expensive for smaller municipalities to implement. One possible method to reduce costs is to regionalize dispatch centers, which use mobile broadband and other services, such as J1, which would allow costs to be shared between several towns. Another key issue raised is the status of the state of NH's FirstNet program.[26] Many public safety and local IT officials have expressed concern that limited progress is being made in unrolling this program to

[26] FirstNet is an agency within the National Telecommunications and Information Administration (NTIA) with the purpose to create a framework for the network and secure nationwide standards for use and access to the network among all states. This network is exclusively to link law enforcement, emergency management, fire, public works, and EMS. (http://www.illinois.gov/firstnet/Pages/default.aspx) Accessed August 13, 2013.

the public and they have been requesting a public information forum be held to provide officials with more information.

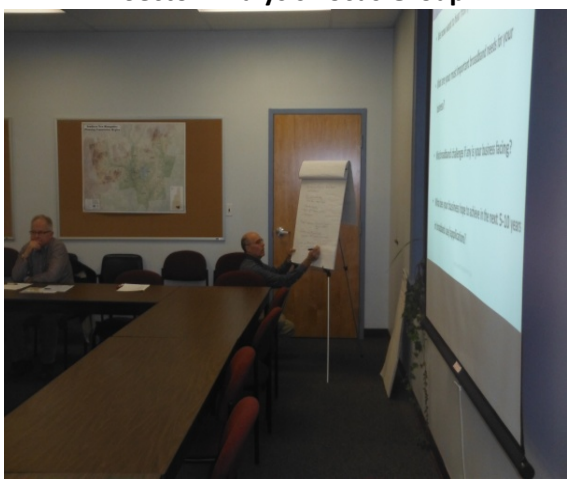
Public Safety Focus Group Attendees:

- Carol Miller, DRED
- John Bryfonski, Bedford Police Department
- John Vogl, Town of Londonderry
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

e) Business/Economic Development

Among the region's business community, network resilience, redundancy, and power backup are also major concerns. Power backup requires having multiple internet connection options available, such as fiber optic and wireless networks, as well as having the option to connect to a fiber loop and employing back-up generators. Other challenges identified by businesses and economic development officials are keeping up with changing technology, a lack of knowledge of all available service options in the region, and limited knowledge and abilities in terms of using the internet and new technologies to their full potential. Potential solutions discussed include hiring dedicated IT staff and having them attend educational courses; however, this was viewed as expensive and a limiting factor for many businesses and organizations.

Figure 5: Economic Development & Business Sector Analysis Focus Group



Source: SNHPC

The survey and focus group discussion also made clear the importance of broadband availability for economic development and business location decisions in the region. Businesses seek locations with high broadband speeds and multiple service providers; businesses located in unserved or underserved areas face a distinct disadvantage. To attract new businesses, both large and small, broadband service and connectivity is a must.

Business/Economic Development Focus Group Attendees:

- Dan Reidy, UNH Cooperative Extension
- Ellen Scarponi, FairPoint Communications
- Tony Matos, Altos Marketing
- Ron Fredette, KW Commercial
- Andrea O'Brien, NH Small Business Development Center
- Shani Luccey, and Husband
- Matt Mercier, Acapella Technologies
- John Nachilly, PSNH
- Elmer Pease, PD Associates, LLC
- Mike Koustas, Waveguide
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

"'Dyn is a great example of New Hampshire natives building and growing a highly successful company here, when they could have gone elsewhere,' Cookson said. 'The company is also very committed to supporting additional new ventures and enhancing our innovation economy, which is terrific. As a tech community, we need to nurture our future Dyns, fund them, mentor them and grow them, as we all benefit from a strong tech ecosystem in NH that creates higher paying jobs, advances economic development, and demonstrates our entrepreneurial culture. Dyn is incredibly supportive of the High Tech Council and if we can build and grow more companies that have this commitment to New Hampshire, we all benefit.'"

("Manchester Firm Dyn Still Growing", Staff Report, Union Leader, February 11, 2014)

Appendix C

Glossary of Terms

All terms as defined by the National Telecommunications and Information Administration, Federal Communications Commission, or State of NH Broadband Action Plan.

Asymmetrical Digital Subscriber Line (ADSL) – ADSL is used primarily by residential customers, such as casual Internet users, who receive a lot of data but do not send out data as much. ADSL typically provides faster speed in the downstream direction than the upstream direction. ADSL allows faster downstream data transmission over the same line used to provide voice service, without disrupting regular telephone calls on that line.

Bandwidth – The transmission capacity of an electronic pathway such as a communications line, computer bus or computer channel. In a digital line, it is measured in bits per second or bytes per second (see Mb/sec). In an analog channel or in a digital channel that is wrapped in a carrier frequency, bandwidth is the difference between the highest and lowest frequencies and is measured in Hertz (kHz, MHz, GHz).

Broadband – A descriptive term for evolving digital technologies that provide consumers a signal switched facility offering integrated access to voice, high-speed data service, video-demand services, and interactive delivery services.

What is Broadband? From Broadband Plan for Southern New Hampshire Region (2014)

Broadband, also called 'high-speed internet,' is the umbrella term referring to internet access that is always on and is faster than dial-up internet access. The National Telecommunications and Information Administration (NTIA) defines broadband as, "advanced communications systems capable of providing high-speed transmission of services such as data, voice, video, complex graphics, and other data-rich information over the internet and other networks."[27] As our technology capabilities are continually changing, it is important to define what broadband is so that stakeholders can determine where broadband is currently available, and how it can be made more widely available to more people.

Broadband is defined in terms of how fast the user's computer can download and upload information from the internet. Download speed is the rate that a computer receives data from the internet while upload speed is the rate a computer can send data. The speed at which information can be transmitted depends on bandwidth. Bandwidth is the transmission capacity of an electronic pathway. That capacity can be described in terms of how much data, measured in bits, can be transmitted per second, and is reported in

[27] "Broadband: As defined by the NH Broadband Mapping and Planning Program," *New Hampshire Broadband Mapping and Planning Program*, February 15, 2012, http://iwantbroadbandnh.com/planning-and-assistance. (accessed July 17, 2013).

kilobits (Kbps), megabits (Mbps), and gigabits (Gbps). NTIA defines broadband as providing a minimum speed of 768 Kbps download and 200 Kbps upload. Most broadband technologies have different downloading and uploading speeds, with upload speed typically being more limited. As technology and applications continually change, there are many different types of broadband services, as well as resulting speeds and functions while using the internet.

Although NTIA defines broadband at a 768 Kbps minimum download threshold, download speeds up to 3 Mbps have limited functionality. At up to 3 Mbps, internet users are able to use web-based email, send and receive small to medium-sized documents, and browse the web. However, operating multiple functions may cause potential slowness, making it difficult to conduct necessary business and education operations. Today, in order to use many internet applications successfully, a minimum download speed of greater than 3 Mbps is required. From 3 Mbps to 6 Mbps download speed, and 1.5 Mbps to 3 Mbps upload speed, users can send and receive photos and word documents through email, conduct multiple functions simultaneously, and access small window videoconferencing, such as Skype.

At 6 Mbps to 10 Mbps download and 3 Mbps to 6 Mbps upload, users can send and receive large documents and files, such as small videos, and can access their company's network while traveling or working from home with a speed of operation that is similar to being in the office. Also, higher quality videoconferencing can be conducted, allowing businesses to communicate with clients, partners, and employees. At 10 Mbps to 25 Mbps download and 6 to 10 Mbps upload, telemedicine and telehealth applications are possible and remote education, professional development, and workshops can occur in high definition (HD) quality. At 25+ Mbps download and 10+ Mbps upload, real time HD medical imaging and consultation can occur.[28] As internet technology and applications continuously emerge and evolve, it takes much more than the minimum broadband threshold to operate successful businesses, and provide relevant education and quality medical care.

The New Hampshire Broadband Mapping and Planning Program developed a matrix to assist stakeholders in understanding the many levels of broadband available in the state of New Hampshire today, as well as the typical functions a user might be able to perform within a range of download and upload speed tiers. Using these tiers, the NHBMPP has established three broadband availability categories ("un-served," "underserved," and "served") to describe access to broadband service. The table below is a condensed version of the NHBMPP matrix.

[28] "Broadband: As defined by the NH Broadband Mapping and Planning Program," *New Hampshire Broadband Mapping and Planning Program*, February 15, 2012, http://iwantbroadbandnh.com/planning-and-assistance. (accessed July 17, 2013).

Figure 1: Tiers of Broadband Service

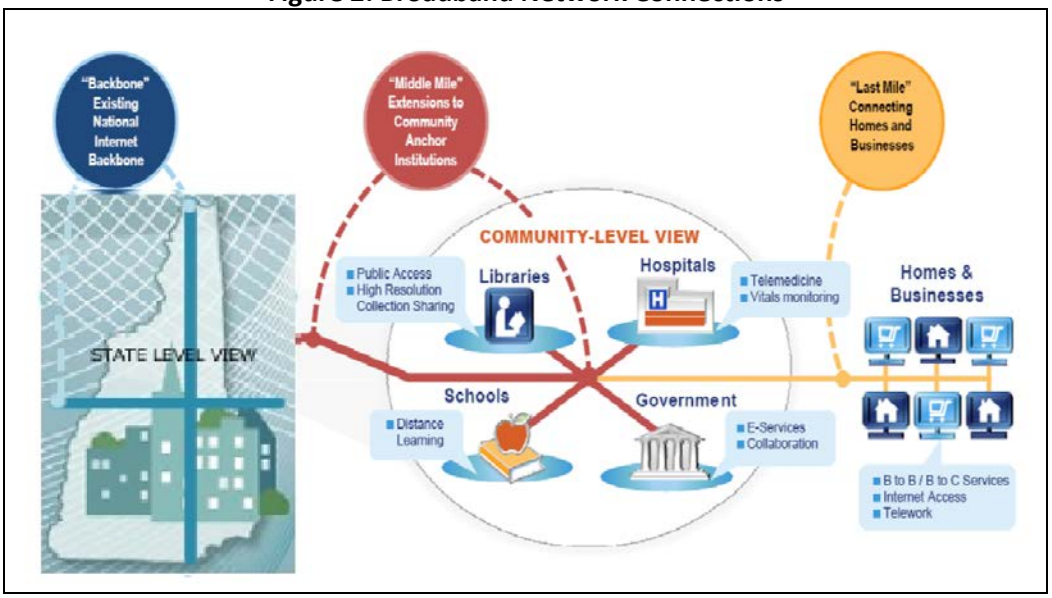
Tiers of Service	Download Speed	Upload Speed	Typical Functions / Use *(functions additive to level above)*
un-served	< 768 Kbps	< 200 Kbps	• Email (client/server-based)
underserved	768 Kbps to < 1.5 Mbps	200 Kbps to < 768 Kbps	• Web-based email • Limited web browsing • Send/receive small documents not concerned with speed of download/upload • Single user internet device
	1.5 Mbps to < 3 Mbps	768 Kbps to <1.5 Mbps	• Medium social media use • Send/Receive medium-size documents/files • Limited streaming content, buffering a concern • 1-3 simultaneous internet devices possible
served	3 Mbps to <6 Mbps	1.5 Mbps to <3 Mbps	• Send/Receive medium to large-size documents or files • Streaming content, downloading High Definition (HD) content, speed a concern • Low quality, small window videoconferencing
	6 Mbps to <10 Mbps	3 Mbps to 6 Mbps	• Send/Receive large documents or files (small videos) • Streaming HD • Virtual Private Network (VPN) access for remote work at speed critical to job function • Multi-player online gaming
	10 Mbps to <25 Mbps	6 Mbps to <10 Mbps	• HD quality, large frame videoconferencing • Remote synchronous education, professional development facilitated simultaneously at multiple locations • Tele-health applications possible
	25+ Mbps	10+ Mbps	• Send/Receive medium to large databases • Real-time HD medical imaging and consultation, remote patient monitoring

Source: New Hampshire Broadband Mapping and Planning Program http://www.iwantbroadbandnh.org

Establishing a broadband connection requires investment in a physical network that facilitates the transfer of information. Broadband infrastructure consists of an internet "backbone," which is hosted by large commercial, government, academic, and other high-capacity network centers. The "middle mile" refers to the segment linking a network operator's core network to the local network plant. In order to transport the internet to homes and businesses, known as the "last mile," it can be most cost-effective to increase the reach of the "middle mile" through community anchor institutions. Community anchor institutions are typically municipal libraries and town offices, hospitals, schools, emergency services and public safety operations, and large businesses that have the means and capacity to access broadband-based services. The majority of home and small business users rely on the last mile hosts, Internet service providers (ISPs), to obtain broadband services.[29]

[29] State of New Hampshire, Department of Resources and Economic Development and The Telecommunications Advisory Board, State of New Hampshire Broadband Action Plan: Appendix A, 2008, http://www.nheconomy.com/uploads/Broadband-Action-Plan-Appendices.pdf . (accessed July 17, 2013).

Figure 2: Broadband Network Connections



Source: http://www.whitehouse.gov/sites/default/files/20091217-recovery-act-investments-broadband.pdf

There are many different broadband delivery technologies. These technologies can be separated into two major categories of wired and wireless broadband. Wired technologies include Digital Subscriber Lines (DSL), Cable Modem, Fiber Optics, Leased Lines (T1), and Broadband over Powerline (BPL). Wireless technologies include mobile wireless (3G, 4G, LTE, WiMax), Wi-Fi, satellite, and Wireless Internet Service Providers (WISP).[30] Wired broadband technologies bring a wire connection to the home or business. Often, a Wi-Fi router is used by the subscriber to share the internet connection wirelessly among different devices within the home, such as a laptop computer or tablet.
Digital Subscriber Lines (DSL) and Cable Modem are wired technologies commonly used by residential and small businesses. DSL uses copper phone lines to deliver direct, one-on-one connections to the internet, allowing users to not have to share bandwidth with neighbors. Users must be located within 18,000 feet (3.4 miles) of a phone company's central office, which means service is often unavailable in rural areas.[31] The most common DSL connections are asymmetric, with networks offering more bandwidth and faster speeds for download compared to upload, since residential users predominately are downloading more information from the internet than uploading. Symmetric types of DSL provide equal bandwidth for uploading and downloading speeds, which is sometimes marketed as "Business DSL" as companies often have greater needs for uploading, or transmitting data.

Cable Modem, which is typically faster than a common asymmetric DSL connection, uses the cable network to deliver broadband to users. Cable networks are a shared connection, so speeds can slow during peak usage times due to congestion when people in the same neighborhood are online. Fiber optic systems use lasers across very thin

[30] "Wireless Internet 101," *Institute for Local Self-Reliance*, http://www.ilsr.org/content-types/fact-sheets-resource-archive/?contenttype=fact-sheets-resource-archive&initiative=broadband. (accessed June 2013).
[31] Shuffstall, Bill, Monica Babine, and Andy Lewis, "Connecting Communities," *The National e-Commerce Extension Initiative*, http://www.connectingcommunities.info/. (accessed July 2013).

strands of glass creating reliable, resilient technology that has an extremely high capacity for speeds and data transmission. There is a high cost associated with laying out the fiber network but once in place, the system can be easily upgraded and maintained, with lower operating costs than DSL, cable, or wireless networks.[32] Building out the fiber network is currently the most effective means to provide the highest capacity broadband internet.

Wireless broadband is available through many technologies, including mobile wireless (3G, 4G, LTE), Wi-Fi, satellite, and Wireless Internet Service Providers (WISP). Unlike wired technologies, which bring wires directly to a location, wireless technologies use radio frequencies through transmitters and receivers to deliver broadband. Wireless broadband can be categorized as wireless networks or satellite. Cell phones, and other mobile devices, use mobile wireless licensed technologies such as 3G, 4G, LTE, WiMax, and other networks. Wi-Fi or 'hotspots' are designed to broadcast the internet for several hundred feet. They are used by public and private networks, including businesses for their employees or retailers for their customers, who connect to the internet using built-in Wi-Fi cards in their mobile devices (e.g. laptops, tablets, cell phones, etc.).

Wireless Internet Service Providers are designed to cover large areas using point-to-multipoint networks to broadcast wireless data up to 20 miles. A signal is broadcast from a base station and is received by a fixed wireless antenna mounted on a customer's premises. A combination of a Wi-Fi Hotspot and a WISP can enable a Neighborhood Internet Service Provider (NISP) or a Wi-Fi Hotzone. A Wi-Fi Hotzone can cover a set geographic area such as a neighborhood, shopping mall, or campground.[33] WISP networks can provide "last mile" solutions and broadband availability to rural areas where it is often cost-prohibitive to build wired networks.

Satellite internet users send and receive information via small dishes installed on the premises to a satellite in space, which retransmits the signal to a network operation center that is connected to the internet. Satellite-based internet connection can be interrupted by objects and weather, and upload speeds are typically slower than wired or other wireless networks.[34] While wireless broadband can offer mobility and access for rural locations, wireless connections are unlikely to overtake the wired network, which is likely to maintain higher speeds and lower costs, especially when compared to a ubiquitous fiber network. Wireless and wired broadband networks can be thought to complement each other to create available broadband internet connections.[35]

Broadband over Power line (BPL) – BPL delivers broadband over the existing low and medium voltage electric power distribution network. BPL speeds are comparable to DSL and cable modem speeds. BPL can be provided to homes using existing electrical connections and outlets. BPL is an emerging technology, currently available in very

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[32] *"Broadband 101," Institute for Self-Reliance,* http://www.ilsr.org/content-types/fact-sheets-resource-archive/?contenttype=fact-sheets-resource-archive&initiative=broadband. (accessed on July 17, 2013).

[33] Shuffstall, Bill, Monica Babine, and Andy Lewis, "Connecting Communities," *The National e-Commerce Extension Initiative*, http://www.connectingcommunities.info/. (accessed July 2013).

[34] Shuffstall, Bill, Monica Babine, and Andy Lewis, "Connecting Communities," *The National e-Commerce Extension Initiative*, http://www.connectingcommunities.info/. (accessed July 2013).

[35] "Wireless Internet 101," *Institute for Local Self-Reliance*, http://www.ilsr.org/content-types/fact-sheets-resource-archive/?contenttype=fact-sheets-resource-archive&initiative=broadband. (accessed June 2013).

limited areas. It has significant potential because power lines are installed virtually everywhere, alleviating the need to build new broadband facilities to every customer.

Dial-Up – Temporary, non-dedicated internet connection made over ordinary telephone lines by dialing an internet service provider's number.

DSL – Digital Subscriber Line (DSL) is a technology that dramatically increases the digital capacity of ordinary telephone lines (the local loops) into the home or office. DSL speeds are based on the distance between the customer and Telco central office. There are two main categories. Asymmetric DSL (ADSL) is for Internet access, where fast downstream is required, but slow upstream is acceptable. Symmetric DSL (SDSL, HDSL, etc.) is designed for connections that require high speed in both directions.

Federal communications Commission (FCC) – The Federal Communications Commission is an independent United States government agency. The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. The FCC's jurisdiction covers the 50 states, the District of Columbia, and U.S. possessions.

Fiber Optic – Refers to systems that use optical fibers. Starting in the late 1960s but gaining serious momentum in the 1980s, the phone companies began to replace their copper long distance trunks with fiber cable. Eventually, all transmission systems and networks are expected to become fiber based, even to the home. In time, the electronic circuits in computers may be partially or fully replaced with circuits of light, in which case fiber pathways would be used throughout the system.

GBps - A gigabit equals one billion bits per second and is typically a measurement for high-speed networks.

Integrated Services Digital Network (**ISDN)** – Is an international standard for switched, digital dial-up telephone service for voice and data. Analog telephones and fax machines are used over ISDN lines, but their signals are converted into digital by the ISDN terminal adapter (see below). Although announced in the early 1980s, it took more than a decade before ISDN became widely available. It enjoyed a surge of growth in the early days of the Internet, because it provided the only higher-speed alternative to analog modems in many areas. Still working in many behind-the scenes applications, ISDN is rarely used for Internet access.

Internet Backbone – A super-fast network spanning the world from one major metropolitan area to another is provided by a handful of national Internet service providers. These organizations use connections running at approximately 45 mbps (T3 lines) linked up at specified interconnection points called national access points (which are located in major metropolitan areas). Local ISPs connect to this backbone through routers so that data can be carried though the backbone to its destination.

Internet Service Provider (ISP) – A company that provides its customers access to the Internet.

Kbps – One thousand bits per second. Kbps is used as a rating of relatively slow transmission speed compared to the common Mbps or Gbps ratings.

Local Area Network (LAN) – A communications network that serves users within a confined geographical area. The "clients" are the user's workstations typically running Windows, although Mac and Linux clients are also used. The "servers" hold programs and data that are shared by the clients. Servers come in a wide range of sizes from Intel-based servers to mainframes. Printers can also be connected to the network and shared.

Last Mile – The connection between the customer and the telephone company, cable company or ISP. The last mile has traditionally used copper-based telephone wire or coaxial cable, but wireless technologies offer alternative options in some locations.

Mbps –One Million bits per second and is used for transmission speeds in a network or in internal circuits.

Middle Mile – The relatively fast, large-capacity connections between backbone and last mile. Middle mile facilities can range from a few miles to a few hundred miles. They are often constructed of fiber optic lines, but microwave and satellite links can be used as well.

Modem – An abbreviated term for "modulator-de-modulator." A modem converts digital signals into analog signals (and vice versa), enabling computers to send and receive data over the telephone networks.

Narrowband – Narrowband Personal Communications Service (PCS) uses a smaller portion of the spectrum than broadband PCS. Narrowband PCS licenses are used to provide such services as two-way paging and other text-based services. For example, licensees offer services using devices that come equipped with a small keyboard allowing a subscriber to both retrieve and send complete messages through microwave signals (e.g. wireless e-mail). Licensees also use the spectrum to offer wireless telemetry which is the monitoring of mobile or fixed equipment in a remote location. For example, a licensee may remotely monitor utility meters of energy companies (this is called automatic meter reading or "AMR").

National Telecommunications and Information Administration (NTIA) – NTIA is an agency in the U.S. Department of Commerce that serves as the executive branch agency principally responsible for advising the President on telecommunications and information policies. In this role, NTIA frequently works with other Executive Branch agencies to develop and present the Administration's position on these issues. Since its creation in 1978, NTIA has been at the cutting edge of critical issues. In addition to representing the Executive Branch in both domestic and international telecommunications and information policy activities, NTIA also manages the Federal use of spectrum; performs

cutting-edge telecommunications research and engineering, including resolving technical telecommunications issues for the Federal government and private sector; and administers infrastructure and public telecommunications facilities grants.

Personal Communications Service (PCS) – Encompasses a wide variety of mobile, portable and ancillary communications services to individuals and businesses. The Commission broadly defined PCS as mobile and fixed communications offerings that serve individuals and businesses, and can be integrated with a variety of competing networks. The spectrum allocated to PCS is divided into three major categories: (1) broadband, (2) narrowband, and (3) unlicensed.

Router – A network device that forwards packets from one network to another. Based on internal routing tables, routers read each incoming packet and decide how to forward it. The destination address in the packets determines which interface on the router outgoing packets are directed to. In large scale enterprise routers, the current traffic load, congestion, line costs and other factors determine which outgoing line to forward to.

Satellite Broadband – Just as satellites orbiting the earth provide necessary links for telephone and television service, they can also provide links for broadband. Satellite broadband is another form of wireless broadband, also useful for serving remote or sparsely populated areas. Downstream and upstream speeds for satellite broadband depend on several factors, including the provider and service package purchased, the consumer's line of sight to the orbiting satellite, and the weather. Typically a consumer can expect to receive (download) at a speed of about 500 Kbps and send (upload) at a speed of about 80 Kbps. These speeds may be slower than DSL and cable modem, but download speed is about 10 times faster than download speed with dial-up Internet access. Service can be disrupted in extreme weather conditions.

Symmetrical Digital Subscriber Line (SDSL) – SDSL is used typically by businesses for services such as video conferencing. Downstream and upstream traffic speeds are equal. Faster forms of SDSL, typically available to businesses, include High-data-rate Digital Subscriber Line (HDSL) and Very High-data-rate Digital Subscriber Line (VDSL).

T-1 – A 1.544 Mbps point-to-point dedicated, digital circuit provided by the telephone companies. The monthly cost is typically based on distance. T1 lines are widely used for private networks as well as interconnections between an organization's PBX or LAN and the Telco. The first T1 line was tariffed by AT&T in January 1983. However, starting in the early 1960s, T1 was deployed in intercity trunks by AT&T to improve signal quality and make more efficient use of the network.

Terrestrial Fixed Wireless – Refers to point-to-point transmission through the air between stationary devices. Fixed wireless is typically used for "last mile" connectivity to buildings.

Terrestrial Mobile Wireless – Refers to transmission through the air from a base station to a moving device such as a smart phone.

Virtual Private Network (VPN) – A private network that is configured within a public network (a carrier's network or the Internet) in order to take advantage of the economies of scale and management facilities of large networks. VPNs are widely used by enterprises to create wide area networks (WANs) that span large geographic areas, to provide site-to-site connections to branch offices and to allow mobile users to dial up their company LANs.

Wide Area Network (WAN) – A long-distance communications network that covers a wide geographic area, such as a state or country. The telephone companies and cellular carriers deploy WANs to service large regional areas or the entire nation. Large enterprises have their own private WANs to link remote offices, or they use the Internet for connectivity. Of course, the Internet is the world's largest WAN.

Wi-Fi – Network devices comply with the IEEE 802.11 wireless Ethernet standards. In the early 2000s, Wi-Fi/802.11 became widely used (initially 802.11b, then 802.11g), and within a short time, all laptops and other handheld devices came with Wi-Fi built in. Earlier laptops can be Wi-Fi enabled by plugging in a Wi-Fi adapter via the USB port or PC Card.

Wireless Communication – Any broadcast or transmission which can be received through microwave or radio frequencies without the use of a cable connection for reception.

Town of Deerfield Broadband Planning Committee

December 4, 2014 Meeting

Attendees:
Jan Foisy, Finance Director
Dave Doran, Planning Board
Kevin Barry, Town Clerk
Denise Greig, Welfare Director
Steve Jamele, IT
Mark A. Tibbetts, Fire Chief
Gary Duquette, Police Chief
Rick Pelletier, Building Inspector
Gerald Coogan, Town Planner, Town of Deerfield
Karen Mattor, Senior Planner, Southern New Hampshire Planning Commission (SNHPC)

I. New Hampshire Broadband Mapping and Planning Program

Ms. Mattor explained that the New Hampshire Broadband Mapping and Planning Program (NHBMPP) is run by UNH. The program creates maps showing where broadband is currently available, determines how it can be more widely available in the future and encourages increased levels of broadband usage. The website is http://www.iwantbroadbandnh.org and the speed test is at http://www.iwantbroadbandnh.org/speed_test.

II. Presentation of the Draft Plan

The draft plan of The Town of Deerfield: A Broadband Chapter for Deerfield's Master Plan including Maps of the broadband coverage in the area was circulated and discussed. The following points were brought up by committee members:

- There was a Cell Tower proposed at 48 South Road but Verizon decided to sell it because of the new technology.
- Members said that mobile phone connection is very bad in South Deerfield including Candia Village and the Raymond town line area.
- The Police Chief and Fire Chief said they have adequate coverage. Emergency Services have Repeaters ; Rockingham Dispatch is used and they are upgrading all radio dispatchers
- Health institutions providing service to Deerfield residents include dentists, eye, vets in Manchester. Lamprey Headquarters, Elliot Hospital, Exeter, Portsmouth, Catholic Medical Center. However, only the health care facilities licensed as medical/health care facilities are on the maps created by SNHPC.

- Local Government – There are no bills done online since they think the cost is prohibitive and they would have to charge 2% to credit card. They do have adequate Broadband.
- There is common Wi-Fi at The Lion Restaurant.
- There is Public Access in the library but no common Wi-Fi.
- Telecommuting works since the Wi-Fi is adequate with Metrocast Cable.
- Discussed what towns use Metrocast and which use Comcast in surrounding area.
- Moultonborough has a Technology Fund of 2%, which over time has grown to $180,000. This can be used to expand service.
- The Town of Chester received $23,000 from the Cable Company last year and put it towards other needs.
- Committee questioned the maps and asked why it showed the Northern Part of Town as having better internet service then the southern part. Later it was confirmed with Amy, SNHPC GIS Specialist, that it is based on Census blocks so if one resident/business had it then the entire census block would be highlighted.
- Servers are Verizon, ATT and Sprint.

III. Next Meeting

It will be worked out with Gerry Coogan and the Planning Board.